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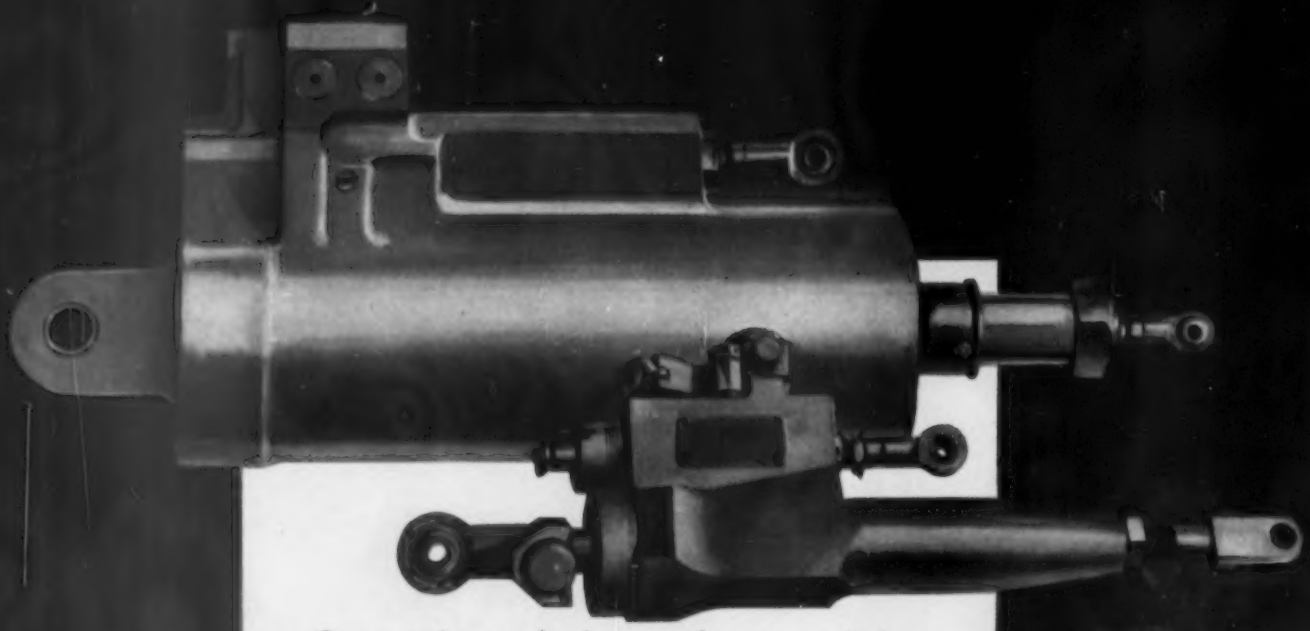

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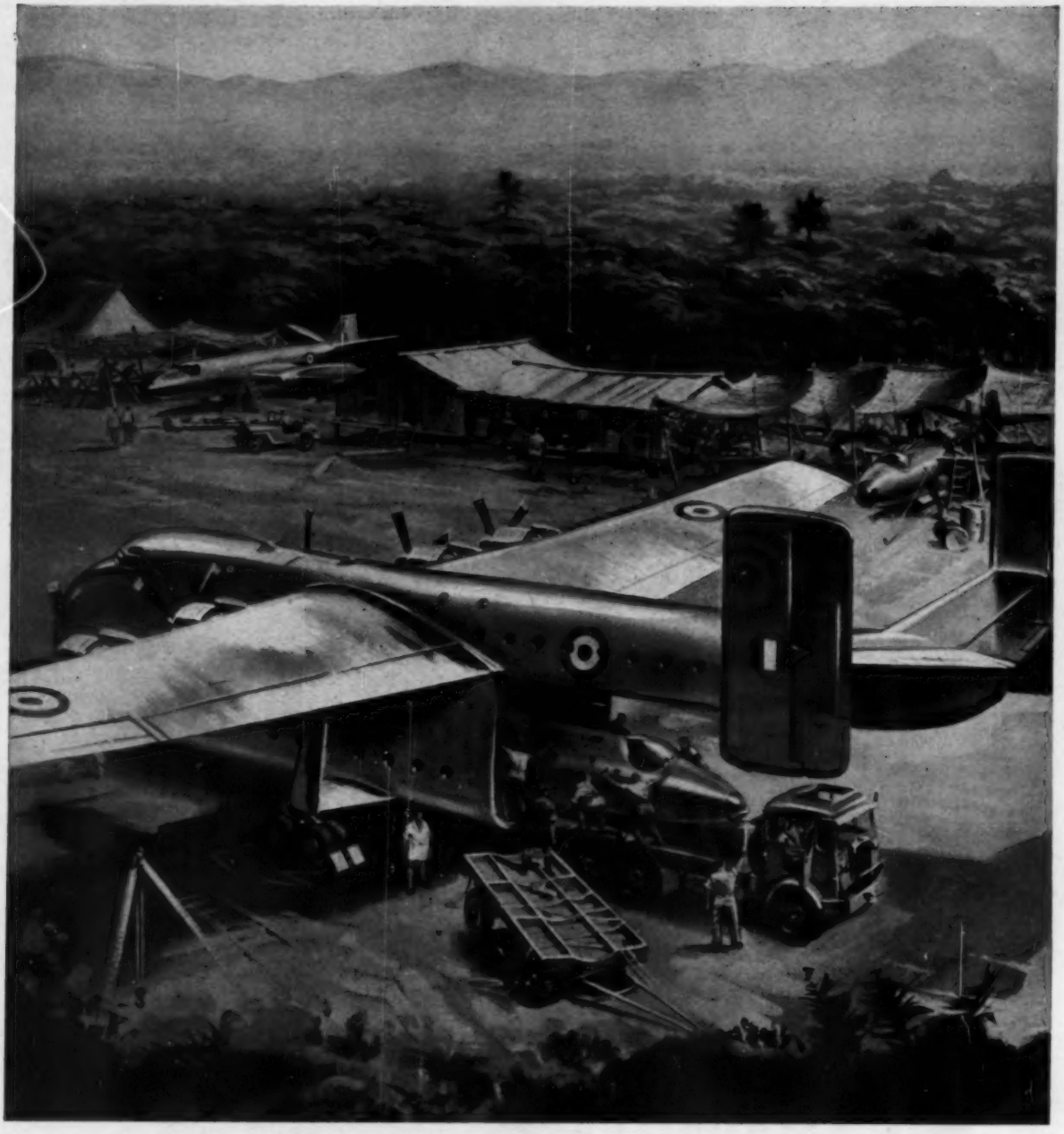

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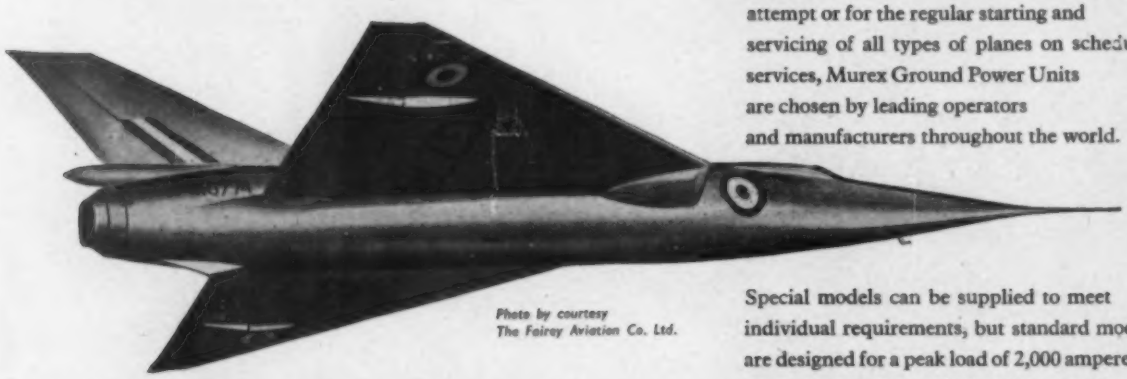

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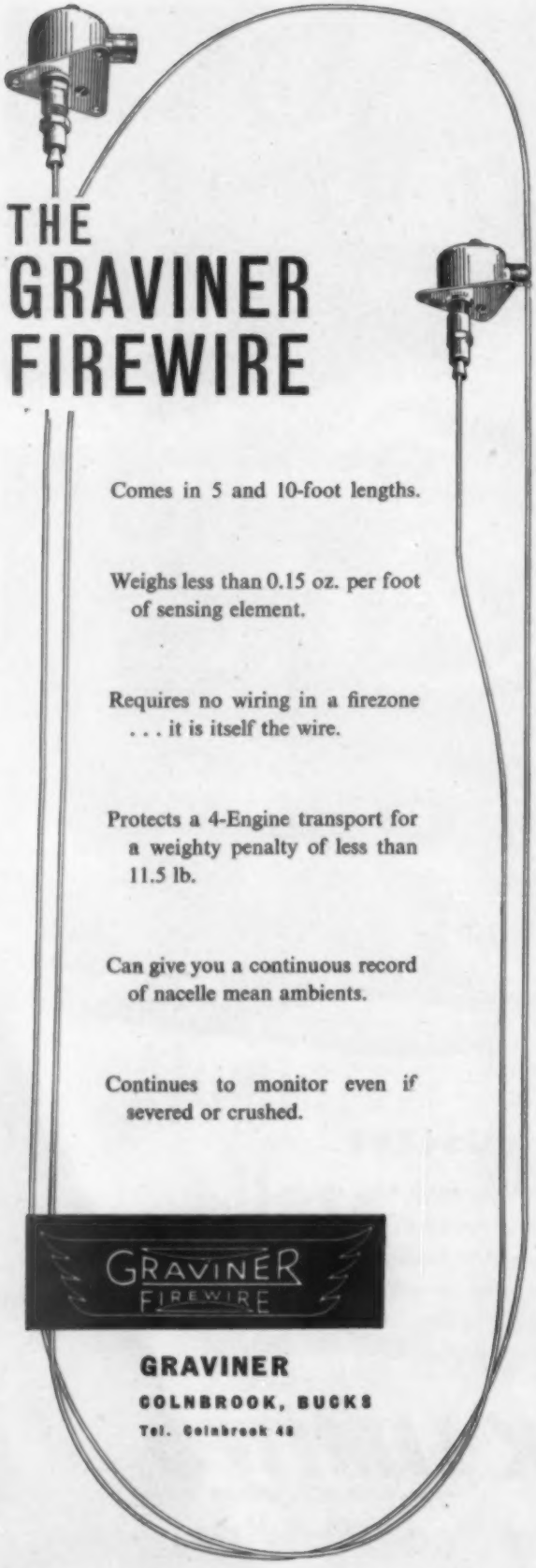

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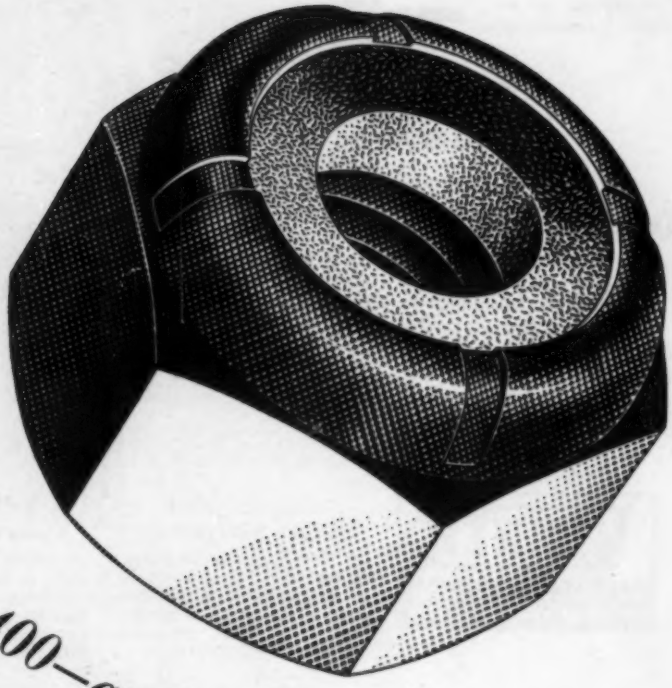

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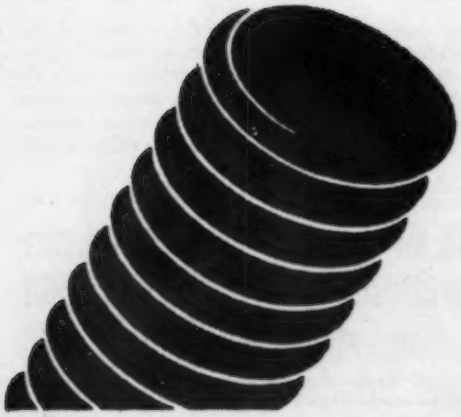

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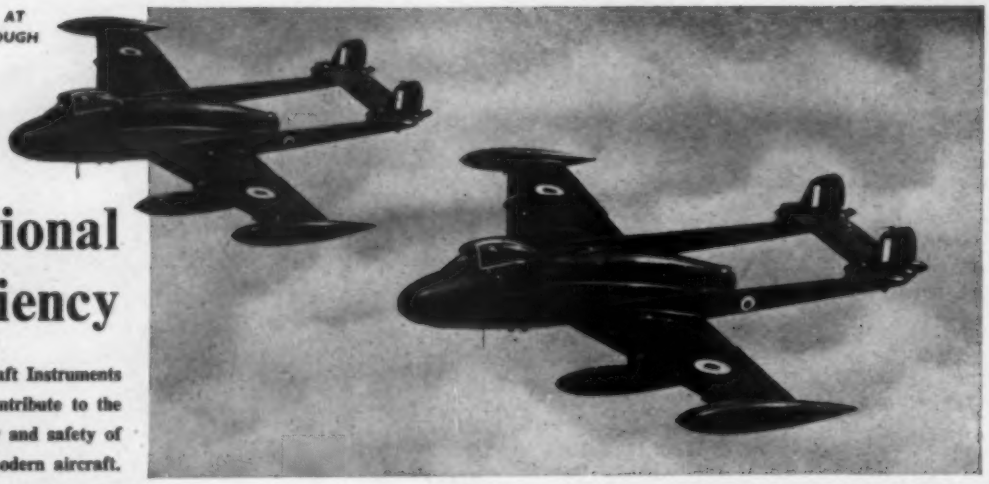

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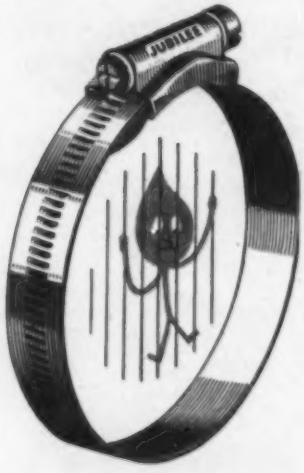

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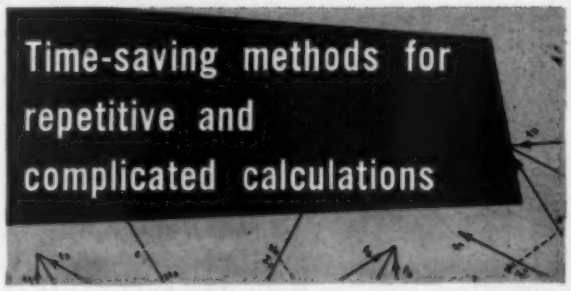

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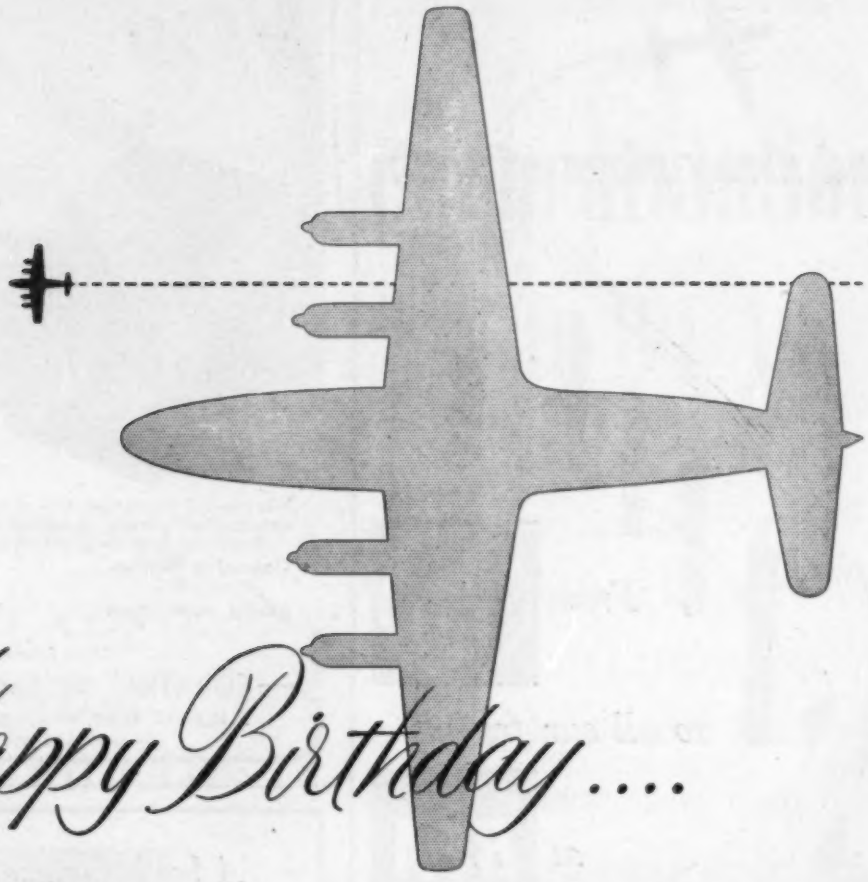

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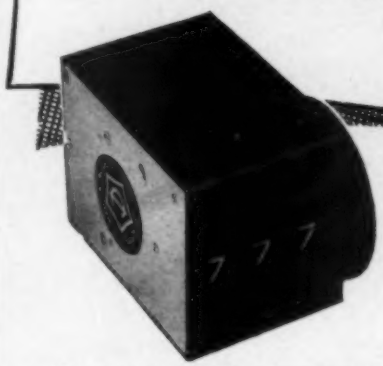

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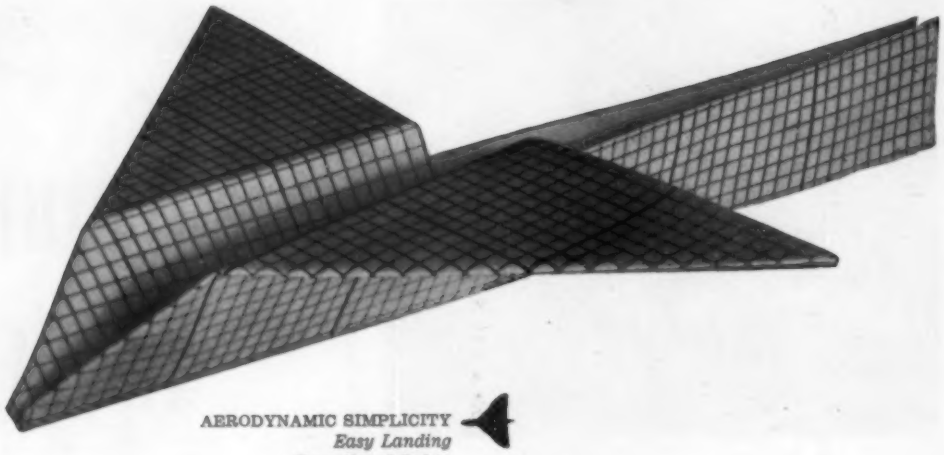

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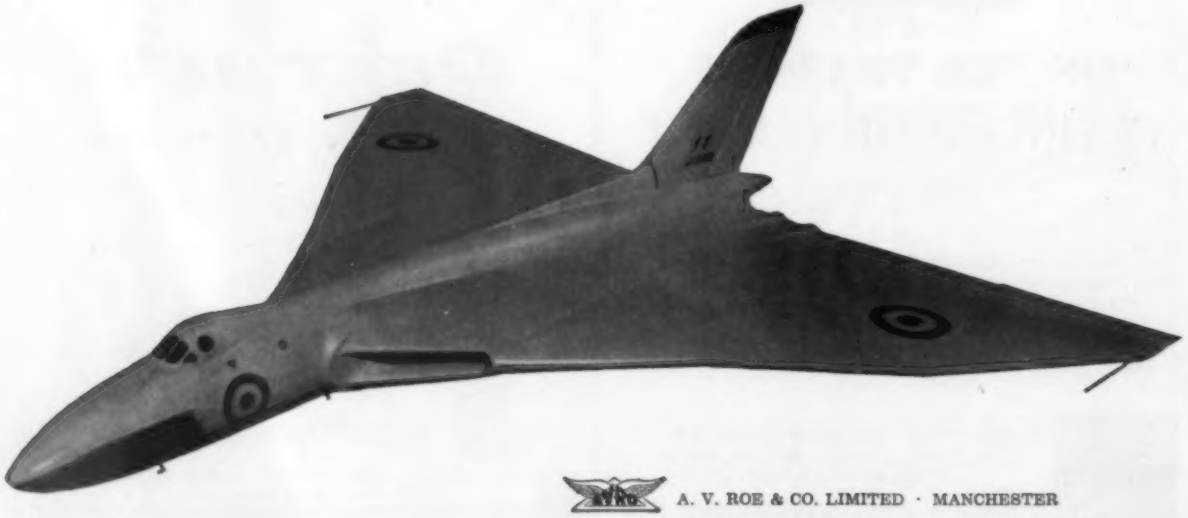

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FLIGHT
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AIRCRAFT ENGINEER

No 2480 Vol 70 FRIDAY 3 AUGUST 1956

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Birthday Salute

IN this issue we record the first ten years of Britain's European flag carrier, and take stock of the achievements of the past decade. Since anniversaries are occasions for looking forward as well as looking back, a glimpse into the future is appropriate.

British European Airways have succeeded in wresting a profit out of a route-network which, economically and politically, is the most complex in the world. It took nine years to do so: not until last year did the corporation finally struggle from the mire of heavy deficit to the firm ground of surplus. The ground was small but this year it will be bigger; and while a State-owned industry is always, in a free and enlightened community, fair game for criticism by its private competitors and the taxpaying public (we have done a fair share), this anniversary is strictly an occasion for whole-hearted congratulation.

It even merits a little modest flag-wagging. Although nationalism in commercial aviation is the despair of those who want to get the fares down, there can be few among us who do not feel a little proud of the fact that B.E.A. has the largest and finest fleet plying the trade routes of Europe, and that as an international carrier it approaches PanAm and T.W.A. in the number of passengers carried each year. Furthermore, B.E.A. supports—no less than it is supported by—the British aircraft industry, and its total investment in the future of the turboprop, a form of propulsion which it pioneered in 1950, amounts to £50m.

The corporation's traffic is increasing at the rate of about 20 per cent each year, while the cost of each capacity ton-mile produced to meet it is being firmly repressed. By 1960, the Viscount-Vanguard fleet will be 100-strong, yet even this may not be sufficient to handle an expected traffic increase of 150 per cent.

Shall we, when B.E.A. celebrates its 15th anniversary in 1961, see pure-jet airliners as co-bearers of the triple-crown insignia? Certainly it may be assumed that careful measure is being taken of Air France's Caravelle challenge; of the effect upon European sector-traffic of 707 and DC-8 operations; and of the present historic happenings at Hatfield. Yet last week's formal signature of a £20m Vanguard and Viscount Major contract was a forceful reminder of B.E.A.'s belief in the future of the turboprop.

Two-way Traffic?

IN recent weeks, with sources of information at last becoming a little less restricted, we have been able to fill in more than one gap in our knowledge of the latest Russian aircraft designs. On pages 185 to 188, with an accompanying explanatory article, are three-view drawings of a dozen of them.

Altogether, the Russian picture gallery adds up to a formidable exhibition of advanced design. There is now no doubt whatever that the Soviet Union has reached a position of parity with the West in aircraft and engine design. Moreover, in their latest types the Russians seem to have avoided the vicious circle of endemic troubles which have so often made the development schedules of Western aircraft read like the time-tables of an Emett railway. Time and again comes evidence suggesting that Russia has taken the easy way out yet has suffered no penalty by so doing. Wings have been manufactured by World War 2 methods, using standard sheet and adopting conventional thickness/chord ratios, and where the limit of practicable sweep has been reached the designer has said, "fair enough, here we stop"; except on the supersonic machines, powered controls are conspicuous by their absence, even the great bombers relying, quite adequately, on aerodynamic tabs; and, perhaps by luck or by studying the faults of the West, efficient helicopter rotor systems have been evolved in less than half the time usually considered necessary. For ourselves, we welcome this beginning (if such it is) of something more nearly approaching two-way traffic in aviation intelligence. There has long been an element of unreality about reporting the activities of every aircraft-building country except one of the most important.

FROM ALL QUARTERS

Fleet Air Arm Honoured

LAST Monday, July 30, the Queen presented her Colour to the Royal Naval Barracks, Lee-on-Solent, Hants, "in recognition of the size and status of the Fleet Air Arm", whose headquarters are there.

Although the presentation took place in very gusty conditions, which caused drums piled for the consecration ceremony to be unceremoniously blown away into the ranks of W.R.N.S. and elsewhere, these did not interfere with a low-level fly-past of over a hundred aircraft representing Naval squadrons and R.N.V.R. air divisions.

The fly-past, led by Rear Admiral C. L. G. Evans, Flag Officer Flying Training, in a Vampire, included Gannets, Sea Hawks, Sea Venoms, Attackers and various helicopters. Five aircraft were drawn up on the parade ground, pride of place being given to the last surviving airworthy Swordfish, which was flanked by two Gannets and two Sea Hawks.

Exports Record

DURING the first six months of this year British aviation exports reached what has been described as the "unparalleled" total of £55,916,532. This is 82 per cent higher than for the corresponding period of 1955, and the figure is within £10,250,000 of last year's record *annual* total.

The United States bought British aircraft valued at £7,141,529 in the first six months of this year (these were, of course, mainly Viscounts). Other principal customers were Australia (£8,500,000), Sweden (£2,500,000), France (£1,800,000), Belgium (£1,700,000), Canada (£1,500,000) and the Netherlands (£1,400,000).

The total for June, £10,401,023, was the second highest yet recorded in any month.

New Designations

SEVERAL new mark numbers for British military aircraft may now be officially referred to. One of the most involved yet to be published is Vickers-Armstrongs Valiant B(PR)K.1, indicating the Mk 1 Valiant tanker, convertible to bomber and photo-reconnaissance missions. Another variant, also superficially like its predecessors, is the Fairey Gannet A.S.4 with a more powerful Double Mamba. The prototype, WN 372, flew on March 12 last and the first production A.S.4, XA 412, flew on April 13.

Also announced are the de Havilland Comet C.2 and T.2 and the radio-controlled Fairey Firefly U.9 and Gloster Meteor U.15 and U.16. In the engine field, D. Napier and Son are permitted to quote Gazelle ratings from NGa.1 (1,260 s.h.p.) to NGa.4 (2,000 s.h.p.).

Guided-weapon Trials Ship

THE Royal Navy's first guided-weapon trials ship, H.M.S. *Girdle Ness* (Captain M. G. Greig, D.S.C., R.N.) was commissioned last week. In a few weeks' time, after a shake-down cruise, she will be available for weapon tests, the first of which —presumably to test the radar and, later, launching characteristics with dummy rounds—will be carried out in the English Channel. Subsequently the ship will proceed to the Irish Sea, where practice will be obtained in operating target drones launched from a land base and handed on to H.M.S. *Girdle Ness* to control.

The vessel (writes a correspondent who recently visited her) is equipped with one multiple launcher—three sets of three rails—mounted upon a modified gun-turret platform on the foredeck. In each set, two rails are fitted opposite each other in the lateral plane and the third is situated above. A surface suitable for a sliding contact shoe is provided below. There was no visible indication of how the services in a missile are to be kept warmed up and running during the final handling sequence, as would be necessary if a high rate of fire were demanded.

Abaft the fully enclosed bridge structure are a telemetry receiving aerial and an octagonal radar dish aerial, the latter presumably providing the beamed signals to control the missile after it has been gathered into the beam following launching. Intermediate radar that would be used to discriminate between the individual targets presented by the enemy attacking force is indicated by another aerial, and the after part of the ship is equipped with the normal radar antennae required to establish the overall picture of the air situation.

Because so much of the search radar equipment is concerned with the identification of airborne targets, and because it was stated that the initial trials are to be carried out with one particular type of weapon only, it can be assumed that the performance of a sea-to-air defensive missile is to be evaluated. The size of the launcher suggests that such a missile, complete with boosters, might be about 20ft in length. The foreign aeronautical Press, incidentally, has reported that Armstrong Whitworth are developing a weapon for the Royal Navy.

The ship carries a crew of 33 officers and 360 men, together with 20 civilian members of the Royal Naval Scientific Service who are responsible for recording the results of the individual trials. Up to 30 civilian technicians representing the main contractors responsible for the design of the weapon and its control system will also be accommodated on board.

Three phases are envisaged in the trials programme. During the first, the weapon and its system will be operated by the civilian technicians; during the second, Royal Naval personnel will operate under the general supervision of the civilian technicians; and in the third the Naval team will assume entire responsibility.

STANDARD PROCEDURE: During her visit to R.A.F. Station Marham on July 23 (recorded on this page last week) the Queen presented a squadron standard to No. 207 Sqn. Here Her Majesty, having received the standard from Air Marshal Sir Harry Broadhurst (A.O.C.-in-C., Bomber Command), presents it to the standard bearer, F/O. R.C. Havers.

CANBERRAS AND VALIANTS, with a Victor and Vulcan in the background, ready for inspection during the Queen's visit to Marham. The Canberras can be seen by their varied fin markings to belong to a number of different light-bomber wings, the diced fin at right denoting the Wittering Wing and the bat at left No. 18 Squadron. Valiants are based at Marham and appear as yet to carry no distinctive markings.

Ballistic Missile Development

THE head of the U.S. Air Force ballistic development programme, Major B. Schriever, has said that development of an intercontinental missile is being carried on "as fast as possible." In a statement made to the U.S. Senate airpower sub-committee, and released only after heavy censorship, Maj. Schriever said that despite the complicated development programme he believed the missile would be produced "on time."

In the statement as released, there was no indication of how long the missile would take to develop, but Mr. Charles Wilson, U.S. Secretary of Defence, has predicted that it may be another five years.

Major Schriever said he did not think that the entry of the U.S. Army and Navy into the guided missiles field [late last year they were ordered by the State Department to embark on separate projects to develop a ballistic missile with 1,500-mile range] had interfered with the Air Force's development programme.

India's Gnats

FROM New Delhi comes a report that negotiations between India and Folland Aircraft, Ltd., for the manufacture of the Gnat are expected to be completed "very soon." This was stated in Parliament last weekend by the Minister for Defence Organization, Mr. Mahavir Tyagi.

He said that no new company would be formed to manufacture the aircraft. The airframes will be made by Hindustan Aircraft, Ltd., at Bangalore and "a new factory is to be set up for the manufacture of the engines."

External Combustion

THE time and place of an apparently successful U.S. experiment in the direction of nuclear-powered aircraft were disclosed recently by Mr. Lewis Strauss, chairman of the U.S. atomic energy commission.

In evidence just made public, Mr. Strauss told the House of Representatives' appropriations sub-committee: "In January, a turbojet engine was for the first time powered exclusively by heat from an experimental reactor operating on the ground at our testing station in Idaho. More ambitious tests will follow."

The Waterton Book

NOT unexpectedly, certain passages in S/L. W. A. Waterton's book *The Quick and the Dead* (reviewed on page 203 of this issue) brought quick repercussions. The Gloster Aircraft Co., Ltd., last week issued a long statement taking exception to their former chief test pilot's "grave allegations of negligence and incompetence . . . not substantiated by the facts."

After referring to the circumstances in which Waterton left the company in March 1954—it is alleged that he "showed a marked disinclination to continue the necessary research flight testing of the Javelin"—the statement goes on to say:—

"In view of the damage which could be done to national as well as the company's interests by S/L. Waterton's reference to the Javelin, it must be made clear that the aircraft with which he was familiar were vastly different from the aircraft now being delivered for R.A.F. service. Practically all the test flying of direct value to the aircraft now in service and most of their modifications have been carried out since his dismissal. With the first representative Mark 1 prototype, WT 830, he made only 17 flights totalling 13 hours. The major development on the Javelin at high Mach numbers and supersonic flight investigation, stalling and spinning, has been done by other pilots. The flight development work on the Javelin had totalled over 1,000 hours by April this year.

"The company feel compelled to refute in detail only one of S/L. Waterton's specific allegations . . . This is his interpretation of the circumstances in which their test pilot, Peter Lawrence, met his death, and the company's subsequent actions concerning Javelin modifications.

"Some time before Peter Lawrence's accident S/L. Waterton reported a change of trim which occurred with the aircraft using flaps on landing approach. This was also reported by other equally experienced pilots, none of whom however considered it excessive or dangerous as the aircraft could be easily controlled in these circumstances. The urgent testing work in hand at this early stage of the aircraft's development was therefore carried on while a modification to the flaps was put in hand. Such a procedure is normal and practical in the development of any new aircraft.

"The characteristics reported by S/L. Waterton, however, had nothing to do with the accident to Peter Lawrence. He was detailed to test the low-speed flying characteristics of the aircraft at an altitude of 20,000 feet with flaps both up and down. He did this in the morning without experiencing any unusual occurrence or difficulty. In the afternoon he set out to repeat the test. Salvaged records showed that he had lowered his flaps at considerably lower speed and altitude than in the morning. Peter Lawrence, in fact, was exploring the unknown and fell into an extreme condition which had not been discovered by S/L. Waterton. There was nothing which S/L. Waterton had discovered in flight or that had been indicated by wind tunnel tests at that time which could have predicted the condition in which Peter Lawrence found himself. It is therefore quite untrue that S/L. Waterton's observations on the Javelin before this time pointed to the set of circumstances which caused the accident.

"Subsequent to the accident an official and detailed investigation of this previously unencountered condition was carried out, not only for the Javelin but also for other modern aircraft. It was during the course of these investigations that, quite incidentally, it was confirmed that the trim condition noted by S/L. Waterton and others could be alleviated by a certain modification to the flaps already put in hand. This was incorporated to improve the aircraft's approach characteristics, but it must be emphasised that this modification had no bearing whatsoever on the condition which caused Peter Lawrence's accident and would not have prevented it. . . ."

DOUBLE TURBOPROP STRETCH: By a pleasing coincidence the first members of both new Viscount and Britannia families came up for flight-test at about the same time. B.E.A.'s first Viscount 802 is seen on its maiden flight from Hurn last Friday. It is 3ft 10in longer than the 700 ahead of the wing (9ft 3in internally), and accommodates about 70 tourist passengers compared with about 50. (Below) The crimson-and-white Britannia 301, the first flight of which is imminent. Compared with the Britannia 100, it is 10ft 3in longer (6ft 10in ahead of the wing), and seats about 130, compared with 90.

Another statement came from Mr. Eric Greenwood, Gloster chief test pilot from 1944 to 1947. It says, in part:—

"It may be that the British aircraft industry and its aeroplanes—to which many of us have been proud to devote our lives—needs vigorous and honest critics. S/L. Waterton, although he has chosen the rôle of critic, has failed irrevocably to inspire our respect. He used his knowledge of aviation affairs, gained in positions of highest trust, to pursue his grudges in the Press for more than two years. Until today we have felt it best to keep silent. . . . Only one of his irresponsible inaccuracies has ever been answered. When Waterton declared, in an accusing article, that the Javelin was not flying faster than sound, he and millions of others heard 'the bang that shook London.' That Javelin bang may have been accidental, but it was the kind of reply I believe that I and my colleagues past and present will always applaud . . ."

Commenting on the Gloster statement, S/L. Waterton said that it left unanswered his criticisms of British aircraft quality and quantity. Reports on all his test flights, as well as those of other pilots, went to the firm and the M.o.S.—"they should still be available and I feel they would speak for themselves." S/L. Waterton also claimed that the reference to his leaving the company was inaccurate. "I had previously resigned and was persuaded to stay," he said. "Eleven days before we parted company I presented my statement of my dissatisfaction with the then current state of affairs. As a result of this, and only after it, I was dismissed."

Flight has also received a letter from S/L. R. F. Martin, the company's present chief test pilot, who says: "No modification suggested by Waterton or anyone else at the time would have prevented the accident. Lawrence was the first pilot to explore the particular flight conditions which led to it, and considerable further investigation had to be done both in the air and on the ground before the answer was understood."

In the Commons on Monday, Mr. Frank Beswick asked the Minister of Supply a number of questions arising from the allegations in the book. Mr. Maudling said that the Javelin accident, after official investigation, was attributed to a condition known as "stabilized super-stall," not previously experienced; and that he was satisfied that aircraft firms, and Glosters in particular, provided his department with full reports from pilots on test flights.

Undoubtedly the "hottest" aircraft at Venice was the little Partenavia P-55 Tornado, which achieves over 200 m.p.h. with a 150 h.p. Lycoming.

"FLIGHT" photographs

Sixth International Meeting at Venice

By C. M. LAMBERT

LIGHT AIRCRAFT ON THE LIDO

WHAT finer place could one choose for an international light aircraft meeting than Venice? What more summery weather than that of an Italian July? And what better hospitality than that of the Venice Aero Club? With all this like a mirage before me I poled *Flight's* Gemini southwards across France and eastwards across Italy to attend the Sixth International Light Aircraft Meeting at the Venice Lido Airport between July 19 and 23, to see what the European and American light aircraft industries had to show this year. The Germans, Italians, Swiss and Belgians were exhibiting aircraft of their own and other countries' manufacture, but British and French aircraft and representatives were conspicuous by their absence. The French had taken a prominent part in previous years, but this time, at the last moment, they were all prevented from coming. The British, it seemed, were not interested and never had been.

The organizers of the Venice Show set out each year to gather together all new light aircraft (including gliders and helicopters) or older types which have been modified in some significant way, and to make them available for inspection and evaluation by interested parties and the technical press. The pilots and a number of passengers in each case are accommodated free of charge in one of the large hotels on the Lido, and their aircraft are sheltered and guarded and tanks filled for the return journey, also free of charge. For the first three days the show is informal and gives an opportunity for individual air tests and demonstrations, while the last afternoon is taken up with a formal air show before a public audience. The result is an uncommonly friendly gathering of aircraft, designers, pilots and enthusiasts from many countries. And next year it is hoped to exhibit ancillary equipment as well and to make the meeting much more of a "light-aircraft Farnborough." The event is gaining in popularity and importance each year.

This time there were not so many aircraft as before, but there was great variety. The Italians showed the very attractive new Aviamilano F.8 Falco, designed by Stelio Frati, and the potent Partenavia P-55 Tornado which has twice won the Giro di Sicilia. Also there was the latest Meteor F.L.55 light four-seater and a Canguro glider with a 20 h.p. flat-twin engine mounted on a pylon over the centre section. The Belgian representative of Piper brought an Apache with an advanced Lear three-axis autopilot embodying height lock and approach coupler; the Swiss representative of Cessna arrived in the new Cessna 182 with tricycle undercarriage; and the Swiss agent of the Czech Aero company brought a Super Aero 45 with the latest Walter Minor 105 h.p. engines and electrically operated v.p. airscrews. Heini Dittmar, famous wartime Messerschmitt test pilot, flew across the Brenner Pass with two passengers in the 90 h.p.-engined H.D. 156 Möve designed by him and built by Herr Theinert in his toyshop at Augsburg. An Italian owner came with a Saab 91C Safir and the Venetian fire service were on hand with their Agusta Bell 47 helicopter. Most handsome of the gliders was undoubtedly the Jugoslav Meteor single-seater, which had been towed to Venice direct from St. Yan where its pilot, Saradic, had gained fourth place in the international World Gliding Championships.

Sadly missing were any of the new light jet aircraft—particularly the English machines, which have not yet appeared abroad. The diminutive French Payen delta was hourly expected for the first two days, but finally could not make it; weather conditions were never uniformly good along the whole route.

During the first few days of getting to know people and discussing aircraft, I had the opportunity of flying several of the machines on show, particularly the Super Aero 45, Cessna 182, Dittmar Möve and the Tornado—the last-named undoubtedly the "hottest" machine at the show.

The Super Aero 45 was registered in Switzerland and shown by the Swiss company Aero Craft of Zurich, the agents. I flew it with Herr Götte, of the company, and with two Germans as passengers in the back. This is really quite a useful aircraft. It will carry four people and baggage and a full range of navigation and radio equipment. This example had V.H.F. R/T., V.H.F. navigation receiver and I.L.S., M.F. receiver and A.D.F., and facilities for receiving radio over earphones or cabin loudspeaker —a typical American range of equipment. The structure is all-metal, the undercarriage is retractable and the two Walter Minor 4-III engines of 105 h.p. have metal two-bladed airscrews giving the following remarkably good performance: maximum speed,

The Canguro two-seat glider (above) with its flat-twin auxiliary engine and (left) the excellent Aviamilano F.8 Falco two seater.

Heini Dittmar's Möve stands by while the F.8 Falco taxies out for its demonstration during the air show of the meeting's last day.

185 m.p.h.; cruising speed, 160 m.p.h.; take-off distance, 590ft; two-engined ceiling, 20,800ft; single-engined ceiling, 6,700ft; and a maximum rate of climb of just over 1,000 ft/min. The excellent performance on such low power is achieved largely through the variable-pitch airscrews, which, for single-engined flight, can also be feathered. Add to this performance a landing speed of 53 m.p.h., the highly respectable range of 930 statute miles, a maximum weight of 6,800 lb, a payload of 1,820 lb, fuel consumption of 8.2 gal/hr, and a wing loading of 18 lb/sq ft—and compare it with the performance of, for example, a Gipsy Major Gemini. It must be acknowledged, however, that the cabin of the Gemini is significantly wider and offers a very real advantage in comfort, especially for the longer stages. It is also somewhat quieter.

I found the Aero 45 a fraction noisy. But it was extremely pleasant to handle and the controls were light, responsive and well harmonized. Control layout was good and instrumentation was comprehensive, including such helpful items as a carburettor intake temperature gauge. The artificial horizon was a Czech unit of the fully-free-globe type, with the earth and sky segments painted respectively black and light blue. The Gyro D.I. was a German unit with a ball slip-indicator in the lower rim; and in the centre of the first pilot's U-shaped control wheel was a clock —"Swiss, naturally," as Herr Götte remarked.

A brief taste of single-engined performance with four passengers seemed to leave nothing to be desired, and the operation of the airscrews, both in normal flight and during feathering and unfeathering, was simple. There are four main positions on the dual pitch-control quadrants, cruise, climb, take-off and feather; and the pressing of a button while the pitch lever is on the edge of one of these positions allows fine adjustment of r.p.m. Someone remarked that the only feature lacking was a nosewheel undercarriage; but the attitude on the ground is hardly pronounced enough to justify such an addition, and the field of view is entirely adequate. The whole nose cone can be hinged downwards to reveal aerials, battery, radio and the back of the instrument panel for easy servicing. Full heating and ventilating is standard.

The next aircraft I had the chance to fly in was, quite understandably, not nearly so smooth. It was one of the prototypes of the very hot little Partenavia P-55 Tornado. Although the type can easily achieve 210 m.p.h. on 150 h.p. with two people side-by-side, this particular example had a temporary Lycoming installation without the necessary fuel supply system to allow for negative g and therefore to permit aerobatics. The airscrew was also a temporary unit and set at a pitch which gave a rather long take-off run and slow acceleration. The whole airframe is built of wood, plywood-covered throughout, with a laminar-flow wing having the single main spar at about 50 per cent chord and forming the pilots' back-rest. The tail surfaces are extremely small, but very effective at high speeds. Though it is reported that the P-55 was once spun for half a turn, stalling and spinning are apparently not really advisable in the present configuration. Being in prototype form, the cabin is barely furnished and only the minimum of instruments is provided; controls are dual and the nosewheel undercarriage is retracted by a hydraulic hand-pump. An engine-driven pump will later be fitted. Flaps are directly manually operated by a lever.

When retracted the wheels are fully faired into wing and forward fuselage, and when they are down their fairings will drag in long grass, as will a large part of the airscrew disc. Thus, by the time we reached the take-off point, the port wing was covered in grass freshly mowed by the airscrew. Visibility through the sharply raked and moulded windscreen was excellent, but hard suspension made the ride very rough. Flying with the Venetian test pilot Giordano Serena, I was loosely secured to the aircraft by two straps over the shoulders fastened by a clip to a chain on the floor between my legs; he had no harness at all.

The take-off run was protracted, with a fair tendency to turn left, but we became airborne cleanly and continued at low altitude as the speed gradually built up past the 125 m.p.h. level. After some minutes we reached 210 m.p.h. and turned in to beat-up the field. There followed two of the lowest passes I have ever experienced, with the machine porpoising slightly and being viciously thrown about by turbulence, so that we both hit the roof hard several times.

The cabin was hot, and there was a certain smell of warm oil. But with some cleaning up (which will be done) the P-55 should make the most superb little aerobatic and racing machine; and properly handled, it could achieve more on 150 h.p. than almost any other type. First proof of its excellence is that it has twice won the Giro di Sicilia; and that requires real performance over fairly long distances.

At a more advanced stage of development—and, in fact, already advanced in production—is the delightful little Aviamilano F.8 Falco, with complete aerobatic capability, very high cruising speed, excellent low-speed handling and a 140 h.p. engine. A description appeared in *Flight* on June 22. Ten have been built and sold and the second batch of 20 is now under way. It was indeed a pity that the manufacturers had made no provision to allow this machine to be flown by the many people who were interested, for it is undoubtedly one of the outstanding high-performance light aircraft in Europe.

(Concluded on page 204)

(Above) M. Goemans, the Belgian Piper agent, taxying in his Lear-autopilot-equipped Apache. (Right) The Jugoslav pilot completes an excellent demonstration of the new Meteor sailplane.

HERE AND THERE

SKY PATROL: The Automobile Association's newly acquired Auster Alpine G-APAA (see paragraph below), in its handsome black-and-yellow finish, being flown by Ronald Porteous, Auster chief test pilot.

Thundertones

AN announcement from Republic Aviation headquarters at Farmingdale, N.Y., says that the F-105 has been officially named Thunderchief. This name, selected by Republic and approved by the U.S.A.F., continues the theme represented by Thunderbolt, Thunderjet, Thunderstreak and Thunderflash.

A.R.B. Appointment

AN announcement by the Air Registration Board states that its council has accepted the nomination of the S.B.A.C. and has appointed Mr. A. F. Burke, managing director of the de Havilland Aircraft Co., Ltd., to be a member of the Board following Mr. F. E. N. St. Barbe's resignation.

Moscow Jumping

TWO British observers, Mr. John Fricker (representing the Royal Aero Club) and Maj. "Dumbo" Willans (for the F.A.I.), are attending the world parachute jumping contest in Moscow. Teams from the Soviet Union, United States, France and Israel are among the competitors, but Britain is not represented on this occasion.

Airliner Development Costs

THE Minister of Supply, Mr. Maudling, stated in a written Parliamentary reply on July 26 that the total costs borne by his department on the development of the Viscount and Ambassador were £1.8m and £1.5m respectively. Expenditure on the Britannia series so far was £5.8m. Such expenditure was recovered wholly or partly by levies imposed on the sale of production aircraft and spares.

A. Cdre. E. D. M. Robertson

WE regret to record the death, at the age of 69, of A. Cdre. E. D. M. Robertson, C.B., D.F.C., formerly Director of Personal Services at the Air Ministry. After a Naval training he was gazetted in the R.N.A.S. and commanded a seaplane carrier in the First World War. He received a permanent commission in the R.A.F. in 1919, became Director of Personal Services in 1930 and held this post until his retirement in 1935. For the next four years A. Cdre. Robertson was superintendent of Croydon Airport, and he was re-employed in the R.A.F. for the whole of the last war.

A.A. Airborne Again

AT Fairoaks Aerodrome last Wednesday the Automobile Association was due to take delivery of a new Auster Alpine, G-APAA, as an addition to its road patrol organization. This aircraft, the first the A.A. has owned since its aviation section was handed over to the Air Ministry at the outbreak of war, will be used as an airborne relay station in conjunction with the radio-equipped road service vehicles.

Hover of Helicopters

AN "unprecedented" number of helicopters will appear when Royal Naval Air Station Lee-on-Solent holds its air day on August 11. Some forty Whirlwinds, Dragonflies, Hillers and Skeeters from Fleet Air Arm anti-submarine, search-and-rescue, experimental and training squadrons are expected to take part. This is believed to be the largest number of helicopters ever seen at a public display in Britain.

Trainers for Germany

AT Erding supply base, near Munich, last Monday 49 training aircraft—29 Harvards and 20 Piper L-18Cs—were handed over to the West German Air Force under the U.S.-German defence assistance aggreement.

Golden Custom

DURING the ten days ending on Monday next, August 6, Silver City Airways were booked to fly 5,000 cars on their air ferry services. Thus last year's record for one month—10,000 cars in August 1955—looks like being soundly beaten.

German Helicopter

A RECENT announcement by the Borgward motor company, Bremen, states that next month they are to start on the development of Germany's first post-war helicopter. Professor Heinrich Focke, whose design work has included several successful helicopters, is to return from Brazil to lead the research and design team.

HALF - FLAP: Local inhabitants waddle out to investigate an Li-2 (DC-3 copy) during the recent Russian expedition to Antarctica.

WELL MET: Capt. F. A. Tricklebank (left) and Capt. A. Caesar - Gordon receive their briefcases —awards for meritorious weather reports — from Sir Graham Sutton at Londonderry House last week. (See "Flight," July 27).

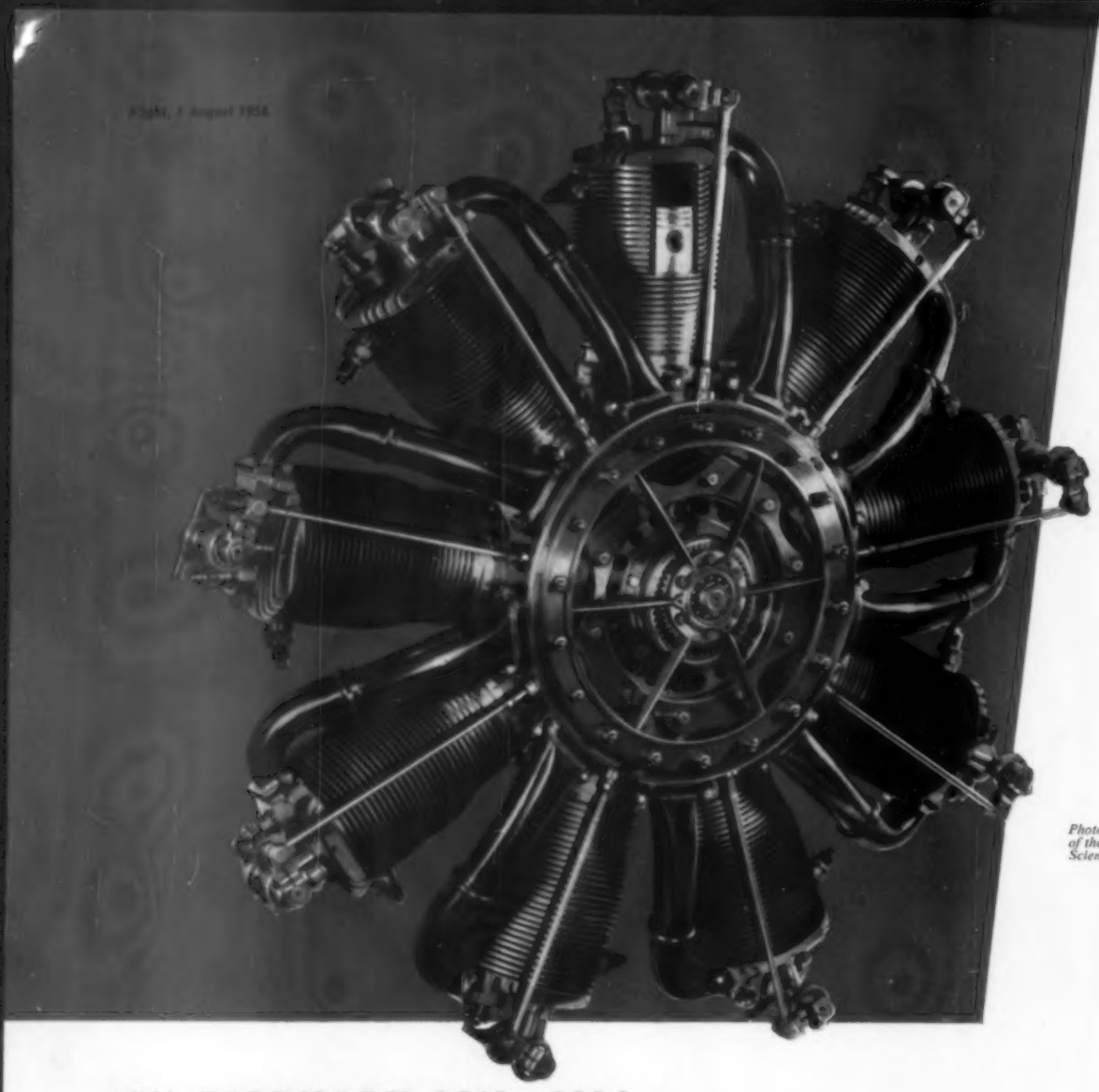
New B.C.A.R.s

A CONSIDERABLY amended edition of British Civil Airworthiness Requirements Section D (Aeroplanes) has been issued. We hope to give details next week.

Spitfire for a Club

AT Chilbolton airfield, Hants, recently, the prototype two-seat Spitfire trainer was presented by Supermarine to the Hampshire Aero Club. Evolved from the Mk 8 Spitfire, this aircraft has been in the firm's possession since it first flew in July 1946. It was given the works number N.32 and later bore the civil registration G-AIDN. Making the presentation, Mr. S. P. Woodley, superintendent of the Supermarine works, said that although the machine was no longer in flying condition he thought it "would give club members much pleasure to have their own Spitfire."

Vuele por
BEA
Turbo-hélice
VISCOUNT
desde
PALMA
VICKERS
VISCOUNT
FOUR ROLLS-ROYCE DART PROPELLER-TURBINE ENGINES
AN AIRLINE TICKET TO ROMANTIC PLACES
BEA VISCOUNT 800 OVER MAJORCA



Photograph by courtesy of the Director of the Science Museum.

ON FEBRUARY 28th, 1914...

. . . the "Flying First Lord" once again took to the air at Hendon. Although a mere fledgling in aviation, Mr. Winston Churchill's interest in the "new fangled flying machines" already hinted at the foresight characteristic of his later genius for leadership. The aircraft used for this flight was a Sopwith biplane fitted with a rotary engine similar to the 90 h.p. Le Rhone shown here. In spite of their whirling mass of machinery and consumption of prodigious quantities of castor oil (up to 2½ gls/hr!) these engines set a new standard for lightness and reliability.

The 1912 Le Rhone shown above was the first rotary to use mechanically operated inlet and exhaust valves, employing a single push-rod and rocker for both valves. This nine-cylinder engine had a bore of 114 mm. and stroke of 152 mm. producing 90 b.h.p. at 1200-1300 r.p.m. with a weight of 2.25 lbs/h.p. It was produced in quantities for the Government by W. H. Allen Son & Co. for installation in such fine old aeroplanes as the D.H.5 Sopwith "Pup" and "Camel", the Bristol Scout and Avro 504.

Although no longer able to recommend castor oil as an entirely satisfactory lubricant Esso research groups can advise on the choice of suitable fuels and lubricants for today's high-powered engines.

It pays to consult

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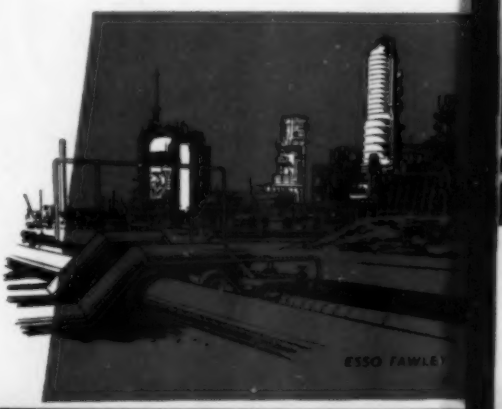


Hunter contrails, showing dark centre in developed stream.

IDENTIFICATION BY CONTRAILS

Possibilities Investigated by the Aircraft Recognition Society

IN a broadcast interview following the All-England Aircraft Recognition Contest in January 1954, Mr. Nigel Price, a member of the winning team, referred to the value of contrail study as an aid to the correct identification of high-flying aircraft. Among aircraft recognition enthusiasts his remarks aroused a good deal of interest and some controversy, and in the 2½ years that have elapsed since the broadcast much useful investigation has been undertaken by members of the Aircraft Recognition Society with the object of establishing the limits within which information gathered from contrails could be considered seriously as an aid to recognition, and, if possible, some accurate system of classification which could act as a guide to further study of the subject. For a variety of reasons, of which the most obvious and the most important is the absolute necessity of establishing beyond all possibility of doubt by visual or other means the identity of the aircraft making the trail, reports admissible as evidence are hard to come by, and research by the Society will continue over a long period. However, a stage has been reached where an interim report is possible, and Mr. L. Anderton, a past chairman of the Society, recently published some conclusions which are of considerable interest.

His report begins with a note on the way in which contrails are usually formed: the exhaust gases from an aero engine contain a considerable amount of water vapour. The amount varies, but may be taken to average about 1¼ lb for every 1 lb of fuel consumed. Free air also contains water vapour, but at the very low temperatures at high altitudes the amount which can be held as invisible vapour is extremely small. Any in excess of this amount condenses out as cloud. The addition of water vapour from the exhaust gases may result in the critical point being reached and passed, the result being the formation of a contrail. [The density of the trail is a function of the weight of fuel burned per mile, and the use of afterburning greatly increases this—a point that was readily apparent during the record runs of the Fairey F.D.2—Ed.]

The amount of water the air can hold depends upon the temperature: the lower the temperature, the smaller the quantity. The heights at which contrails can form will therefore vary in accordance with the prevailing weather. In cold weather they will form at lower altitudes than when conditions are warm. Fig. 1 shows the approximate variation of heights under various weather conditions.

As an aircraft nears the height at which a persistent contrail will be made, it is usual for a short or faint one to appear first, and this gradually develops into the persistent type as the aircraft climbs into colder air. The process continues until the tropopause is reached, i.e., the point where the temperature ceases to decrease with height. At this level, where the aircraft enters the stratosphere, the contrail usually begins to decrease in length, until eventually it is of the short, re-absorbed type once again.*

Factors Influencing Apparent Shape of Contrails. It should be remembered that the cross-section of the contrail of a single-engined aircraft is symmetrical, whereas that of a multi-engined type is not. Because of this, the attitude which a multi-engined aircraft presents to the observer modifies the shape of the contrail-head. For instance, a Canberra, which makes a contrail with a twin-stream head, would appear to be producing a single stream if it were some distance away and flying at right angles to the observer's line of sight. The possibility of recognizing an aircraft by its contrail is limited to some extent by this factor, and the machine must be in a suitable position, relatively to the observer, before a valid opinion can be formed.

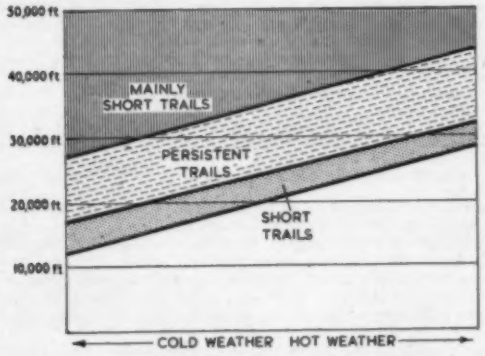
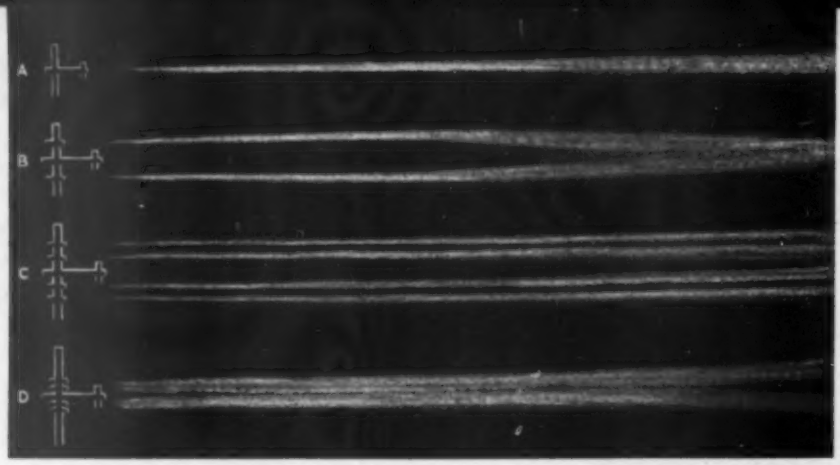


Fig. 1. Variation of trail height with weather.

Besides the attitude, there are a number of other factors which may mislead. Because of the variation of trail-forming height with temperature it is possible for trails to be as low as 12,000ft, or as high as 40,000ft, or even more. When by reason of haze the aircraft itself cannot be seen no judgment of scale is possible; and in these circumstances the distance apart of the head-streams in a multi-engined contrail may easily mislead. For example, the Tornado, when hidden by haze, and making a contrail at 14,000ft, is quite likely to be mistaken for an altogether larger aircraft. Another consideration is the length of the contrail: it may persist, and

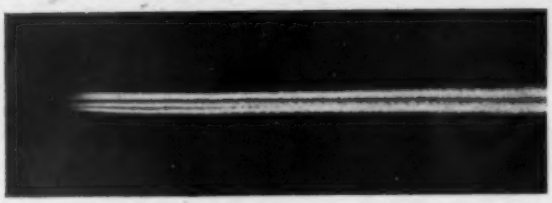
**Fuller details are given in Air Ministry Publication M.O. 480 (A.P. 3315) "Condensation Trails," price 9d, H.M. Stationery Office.*

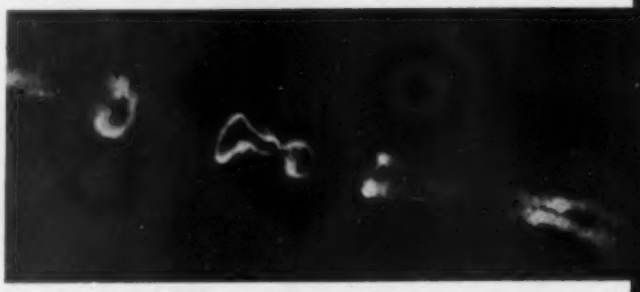
(Left) Hunter—the more pointed—and Canberra trails. The latter is at a greater distance and presenting a side view, hence the illusion of a single-engined aircraft. (Right) Valiant trail, illustrating the characteristic division of the streams.



An artist's impression of the four broad types of trail discussed below.

(Below) B-47 trail and (lower picture) typical decay into curved eddies or closed loops.





IDENTIFICATION BY CONTRAILS . . .

stretch from horizon to horizon; or it may be quickly re-absorbed, giving the effect simply of a short plume. This may prevent the contrail from developing sufficiently to show its characteristic form.

Variations in the distance at which the contrail first appears behind the engine can also take place. Where the streams of a multi-engine contrail are divergent, and the aircraft is obscured by haze, delay in forming will lead to the conclusion that the engines are more widely spaced than they actually are.

Classification of Contrail Types. When it is considered that various combinations of the above factors are not only possible, but indeed probable, it is apparent that the question of recognition by contrails is very complex, and unlikely to have a simple solution. Nevertheless, careful analysis reveals certain classifiable dissimilarities which seem to suggest grouping of contrail types into four easily recognizable categories as a basis for further study:—

(A) Single-engined aircraft—Hunter, Seahawk, etc.

(B) Twin-engined aircraft with the engines well spaced—Meteor, Tornado, etc. (the four-engined Tornado has the trail-effect of a twin).

(C) Multi-engined aircraft with the engines disposed across the span—B-47, Shackleton, etc.

(D) Aircraft with four or more engines close to the fuselage—Comet, Victor, etc.

(Note that in these groupings engines paired in pods are considered as one engine, e.g., the inboard pods of the B-47.)

A fifth group would appear possible, comprising those aircraft which have two engines mounted very close to the fuselage. Coming within this group would presumably be such types as the CF-100 and the Badger. However, it has not so far been possible to make sufficient observations to report with certainty on these aircraft.

Within each of the above classifications many small variations have been noted, giving rise to the hope that with further patient research much progress might be made towards the identification of individual types. In the remainder of this report each category is separately considered and some pointers are given to the direction in which such investigations might profitably proceed.

Group A—Single-engined Aircraft. Thin, single-stream contrail-head. The speed of the aircraft appears to influence the shape of the head. The greater the speed, the more pointed the head. This is particularly noticeable with the Hunter, the head being drawn out to a very fine point. A further feature of the Hunter contrail is a narrow, dark band, which forms along the centre of the trail, starting where the taper of the head reaches its final expansion. The dark band continues to run along the tail of the contrail and is sometimes apparent when the contrail starts to decay. It is remarkable that a single-engined aircraft should produce such an effect. No other variations have been noted in this group.

Group B—Twin-engined Aircraft with Engines Spaced Well Apart. A twin-stream contrail head. The two streams when first leaving the aircraft are slightly divergent. The angle of divergence and the distance for which they continue to diverge varies for different aircraft. The twin stream, after diverging, runs parallel for some distance, and then usually merges into a single stream. The distance behind the aircraft at which this occurs varies for different aircraft. Three types have been noted: Canberra, Tornado and Meteor.

Taking divergence of stream first, the aircraft with the greatest angle is the Canberra, followed by the Meteor and Tornado, in that order. The distance for which the streams continue to diverge comes in the following order: Tornado, Meteor, Canberra. Nevertheless the two streams of the Meteor tend to unite quite a short distance behind the aircraft, whereas those of the Tornado remain separated for a longer distance, and those of the Canberra sometimes do not join up at all but frequently form a narrowly spaced twin contrail which often breaks up into eddies similar to those formed by the contrail of the B-47 when it is decaying (see below).

Group C—Multi-engined Aircraft with Engines Disposed along the Wing. A four- six- or eight-stream contrail head. Separate streams come from each engine, indicating the number of engines. The pattern formed by the beginning of the streams conforms to the wing sweep as a general rule, and reveals if the wing is well swept, or straight. Some streams come out straight, some converge in pairs, and the tail can form into various shapes. Three types have been observed: Lincoln, B-36 and B-47 Stratojet:—

Lincoln: Four parallel streams starting in a straight line. The streams are almost equally spaced except for a slightly wider space between the two centre ones. At some distance behind the head the four streams merge into a rough, broad band.

B-36: Two groups of three parallel streams, with a space between the groups. The streams in each group come together well behind the aircraft, to form two parallel, widely spaced streams, which eventually merge into a broad strip. If the wing-tip jet engines are in use, the groups consist of four streams each, instead of three. The streams of the jet engines diverge slightly from the outer piston engine streams, but eventually join the streams in each group to form the two parallel, widely spaced streams. The sight is very spectacular, giving the impression that the aircraft is throwing out a tremendous amount of cloud.

B-47: The head has two pairs of streams, the inner streams of each pair starting to form slightly ahead of the outer ones, i.e., conforming to the sweep-back of the wings. The streams in each pair quickly join up, to form two parallel streams. Sometimes these break up into curved eddies. The way these eddies form is interesting. The twin contrail breaks up into short sections and the ends of the opposite streams of the sections curve inwards and join together, to form shapes similar to an hour-glass. They sometimes break through at the neck, to form rough circles. The eddies become rapidly reabsorbed, and disappear. The B-47 contrail does not always decay in this manner. It may become persistent, and spread out by the action of the wind into a rough cloud strip, in which case the twin contrail becomes obliterated.

Group D—Aircraft with Four or More Engines Close to Fuselage. The width of the single stream indicates the over-all distance across the engines. If examined closely with binoculars the first beginning of the stream may be seen to have a small vee space, with the point of the vee facing backward. This gives the effect of the streams converging very rapidly to form one broad stream. In the case of the Valiant, after the short, broad head the contrail divides into two parallel streams, which stay apart for quite a long distance but finally merge together as the stream becomes diffused. In a turn, the two streams are thrown apart and do not join up. The stream on the inner side of the turn looks much denser than the one on the outside.

It will be seen from the foregoing brief remarks that thorough and patient analysis can bring to light a great many useful pointers out of which a really practical system of aircraft recognition by contrail may develop. It is hoped, with the help of observers all over the country, to build up a body of information.

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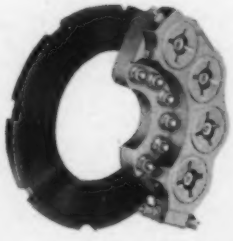


RED ROUND-UP

A Synthesis of the Post-war Development of Russian Aircraft Design

TEN years ago the aeronautical ability of the Russian nation was fairly well known throughout the world, as must always be the case with any power which has just come through a major war. Nevertheless, as the uncertain peace degenerated into the cold war Russian aviation became more and more of an enigma to Western intelligence staffs. Only slight relief was provided by the knowledge—particularly of the Mig-15—gained in Korea. To the Western man-in-the-street true information upon Soviet work was scant in the extreme, and the situation was not helped by the widespread publication of numerous "new types" which existed only in the minds of over-enthusiastic Western journalists. This journal did its utmost in this difficult period to avoid giving credence to reports unless—as the Law has it—the truth was clear "beyond reasonable doubt".

For the removal of doubt nothing can equal a fly-past of actual aircraft. Each year, on May Day, the Soviet Union organizes a great parade through Moscow's Red Square, accompanied by a display of military air power. Further demonstrations of Russian prowess in the air are made at the annual Red Air Day, late in June. Particularly since the end of the Stalin regime these occasions have provided a most welcome series of first-hand glimpses of new designs of aircraft, and in the last three years even prototypes have been displayed. Furthermore, the intelligence gained in 1954 and 1955 was washed into the background by the flood of new things on which Western observers feasted their eyes just over a month ago.

Accounts of what transpired at this most memorable 1956 Aviation Day and its associated festivities were published in our issues of June 29 and July 6. What we intend to do now is to attempt—and it is no more than an attempt—to collate the information on new aircraft into the semblance of a coherent account of what Russian designers have been up to in the past few years.

Certainly we must watch our Russians if we are not to be left hopelessly behind. At the moment we have no doubt that America is technologically ahead of the Soviet Union in most things of a scientific or engineering nature, but our new-found friends in the East are going to set a cracking pace, and it would run contrary to most of the West's ingrained psychological heritage if they should outclass us in *quality*.

Of course, Russia has her problems like every other country. Perhaps the "Bison" has an indicated limit of 600 km/hr, and maybe the Yak-25 is unpopular and difficult to fly; we wouldn't know. Nevertheless, everything the Russians have shown the West has worked superbly and been timed to perfection, bespeaking excellent mechanical reliability and a level of pilot-training which can hardly be inferior to our own. In fact, it seems difficult to deny that not only has the Soviet Union a first-rate air force, but an aircraft industry which is technologically on a par with those of the best Western nations.

Fighters. The old piston-engined Red Air Fleets were always full of single-seat fighters. It is fair to describe their design as uninspired; in general they were smaller than their Western equivalents and almost their only telling advantage was that they were cheap to make and operate. This sort of policy also characterized the first jet fighters, which in certain cases were little more than jet developments of existing piston-engined designs.

By the end of 1947, however, the British Government had supplied Rolls-Royce Derwent and Nene engines against a cash purchase by the Soviet Union. Receipt of these reliable and finely engineered turbojets was a matter of no small consequence, and it initiated the development of a whole series of "Nene derivatives" (generally ascribed to V. Ya. Klimov and designated VK-1).

By the Korean armistice Artem Mikoyan and Mikhail Guryevich had been working together for some fifteen years. During the latter seven years of this period they had been jointly responsible for one of the best and most famous fighter families in the world, based upon the renowned Mig-15, which first went into service in 1949. Between 13,000 and 15,000 (almost unbelievably large numbers) are reported to have been constructed in factories throughout the Communist world.

The Mig-15 was first met in Korea, in 1950, where its performance exasperated opposing pilots flying the F-86 Sabre, which was then by far the best of the Western fighters. Eventually the latter gained the upper hand as a result of better pilot-training and experience, aerodynamic modifications to the Sabre, and intensive efforts which improved the serviceability of the superior American electronic equipment. The basic Mig-15 was fully described by us on July 25, 1952, and a cut-away drawing and cockpit diagram were exclusively published by us on January 28, 1955.

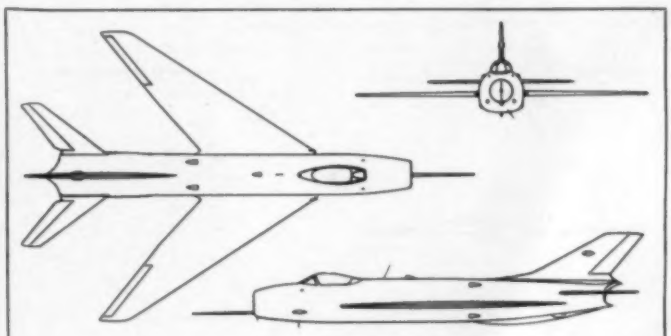
Noteworthy features of the basic -15 are: the intake duct to the engine bifurcated around the cockpit and then split into four by the mid-mounted wing; considerable sweep on all surfaces; armament of two 23 mm and one 37 mm cannon mounted, with ammunition tanks, on a demountable tray under the cockpit; a straightforward stressed-skin structure; an exceptional amount of high-quality welding, both in the airframe and accessory systems; and the employment of manual controls, with both aerodynamic and mass balance. Many thousands of these aircraft are still in front-line service with all the Communist countries and with Egypt, and two-seat trainer and other versions exist.

Mikoyan and Guryevich improved the -15 into the Mig-17 during the early part of the Korean campaign. In this aircraft major and minor aerodynamic improvements matched the increased thrust of an improved VK-1 engine, which, in the latest versions (which are still in production) incorporate an afterburner. It is possible that in a dive the Mig-17 can exceed the speed of sound, and its operational equipment is known to be more advanced and complete than that of its predecessor. Armament—in fact the whole front-end—is identical to that of the Mig-15. At least four versions are in use.

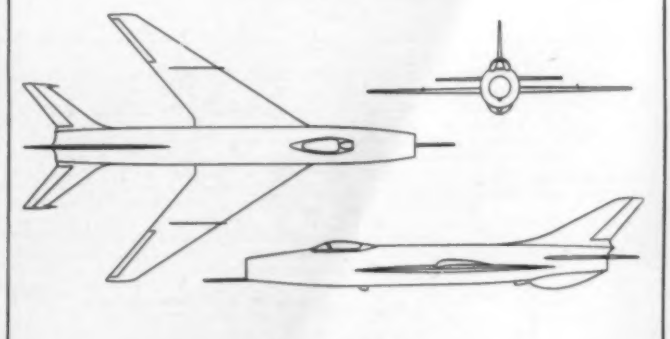
While this machine was beginning to come through the factories, about three years ago, the Mikoyan-Guryevich team were hard at work on its successor. In the design of this machine, known as the Mig-19, they set their sights very high. Aerodynamically they pulled out all the stops to produce an aircraft capable of truly supersonic operation under active-service conditions, drawing upon the knowledge gained from extensive tunnel-testing and also from actual flight trials with supersonic research aircraft. But it was in the field of propulsion that the most notable decision was taken: the Mig-19 was designed to have two engines mounted side-by-side in the fuselage.

Such a choice was made practicable only by the promise of the availability of an outstanding turbojet, wholly Russian in design, delivering some 8,000 lb thrust yet with a diameter no greater than about 32in. It is of paramount importance to note that Russia—aided by many brilliant German engineers—has mastered the gas turbine in no uncertain manner, and her latest units are undoubtedly formidable achievements. Without the particular engine just mentioned there would be no Mig-19 and no Yak-25 either, since, perhaps excepting the still-experimental Gyron Junior, no other engine in the world could meet the requirements. Certainly all experienced pilots of high-speed fighters must envy the Mig-19 pilot his duplicated powerplants. To accommodate the twin engines the rear fuselage is slightly bulged laterally, and the engine-bay skin is unpainted and polished—doubtless to radiate heat, for there cannot be much room for cooling air.

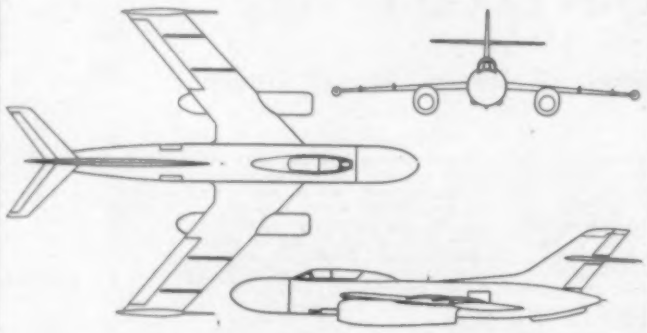
The sweep angle on the leading edge is almost 60 deg (the same as that of the P.1), which has probably allowed the thickness/chord ratio



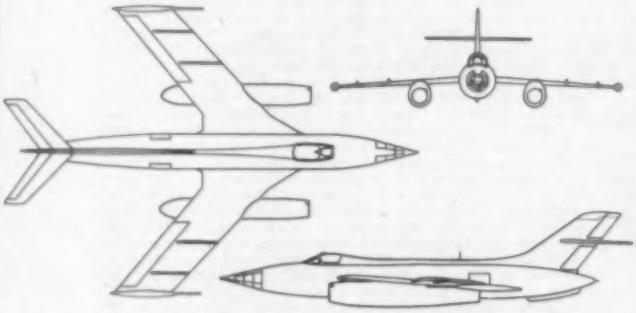
Mig-19.



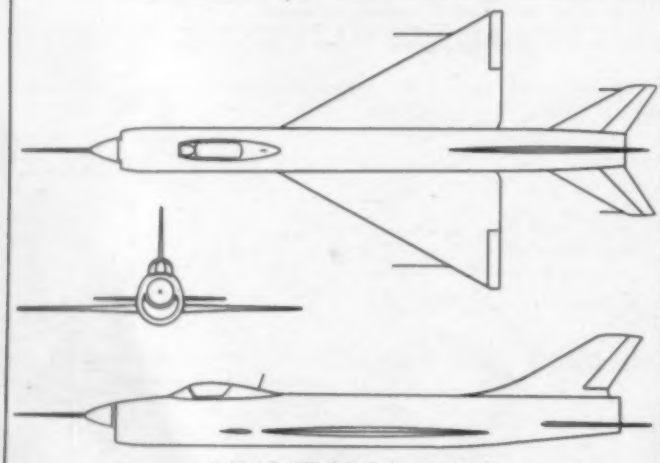
"Super Farmer."



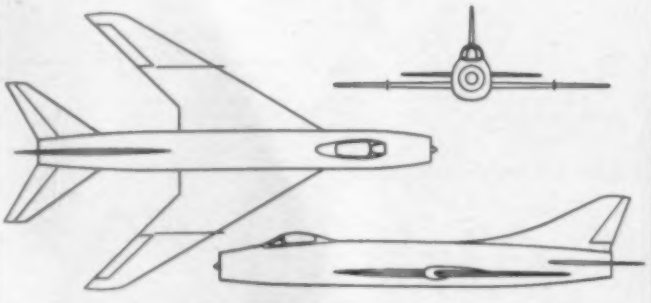
Yak-25.



"Super Flashlight" attack aircraft (a.w. fighter is similar).



Sukhoi-1 ("Flight" designation).



Sukhoi-2 ("Flight" designation).

RED ROUND-UP . .

to stay around the 6 per cent mark. The trailing edge has a slight kink, and it is worth noting that, as in most Russian high-performance machines, the aspect ratio is higher than in Western counterparts. It is curious to find on so fast an aircraft multiple whip and spike aerials and a profusion of accessory intakes standing proud of the skin, together with two small ram intakes at the roots of the wing leading edge. Compared with its predecessors the fuselage of the Mig-19 is very much longer, giving a fineness ratio suitable for supersonic flight and allowing for the stowage of a considerable quantity of fuel (which presumably can be eked out by cruising on one engine).

From the viewpoint of performance the Mig-19 may even beat the F-100, which, in this respect at least, is at present in advance of everything else in the West's operational armoury. The prototype -19 probably flew in 1953, and 47 or 48 took part in the Red Square fly-past last year, whereupon it received the Western code-name of "Farmer." It is now the standard day fighter of the Russian Air Forces.

From the Mig-19 has been evolved an even more advanced fighter, dubbed "Super Farmer" and reported to carry the designation Mig-21. This designation implies that Mikoyan and Guryevitch are still in partnership, although it is being widely asserted that the latter engineer has passed out of the picture.

Be that as it may, the Super Farmer is a highly impressive machine. It is larger than its predecessor and is regarded as being in the 1,200-m.p.h. class (Mach 1.8); altogether, in fact, it seems a fairly close parallel to the North American F-107—apart from the significant question of timing, for the 107 has yet to fly. As far as one can deduce from distant photographs the Super Farmer design has reverted to a single turbojet, although this is clearly an exceedingly large and powerful unit with an afterburner. More than that, the bulge under the rear fuselage may well denote the presence of a rocket motor, which could put the new Russian "on top" in more ways than one (alternatively, of course, it could house armament or other operational equipment). Only one is known to have been built, but there are reasons for thinking that Russia has adopted a form of Cook-Craigie plan, which virtually eliminates prototypes and starts a production line going from the outset.

So much for the single-engined fighters. Russia also has a valuable family of twin-engined fighters from the stable of Aleksandr Yakovlev. The first of these was the Yak-25, which was shown off in numbers at the 1955 Aviation Day, receiving the code name "Flashlight."

Basically the Yak-25 is like a smaller and more square-cut edition of the Vautour. Points of interest include: the unusual design of wing, with apparently constant section throughout the span; the relatively modest size; and the choice of a bicycle-type undercarriage with outriggers housed in small wing-tip fairings. Power is provided by twin turbojets of remarkably slim form—no doubt they are of the same basic design as the engines of the Mig-19—attached directly under the wings. From front to rear the cylindrical fuselage comprises: a nose radome of proportions suggesting really powerful radar; tandem cockpits for pilot and navigator with armament and nose gear under the floor; a substantial amount of fuel tankage above and below the wing (probably supplemented by integral wing tanks); and an under-fin.

Speculation exists regarding the armament; there is certainly evidence of a belly tray, which could house guns or small rockets, and the aircraft seems well suited to the launching of guided missiles from beneath the wings. In spite of the drag of the four wing fences the performance is very high, and may include sonic clearance in a dive.

This year Yakovlev has gone two better and has produced two variants of a "hotted-up" successor which, for want of a better designation, can be called "Super Flashlight." Both have more powerful engines (probably a redesign of the same basic unit), in finely profiled nacelles projecting well ahead of and behind the wing. The identity of these turbojets has not been confirmed but, with or without afterburning, they can probably drive the new fighters faster than sound on the level. This contention is partly borne out by aerodynamic modifications, which include increasing the root chord (by sweeping forward the leading edge inboard of the nacelles still more acutely) and bringing the nose forward to a sharp point with no more than 30 deg included angle.

One of the Super Flashlights is an all-weather fighter, which presumably will be a direct replacement of the Yak-25. The other is designed for different functions, which probably include photo-reconnaissance and attack with external and, possibly, internal stores. In this aircraft the navigator has been relocated to a position in the nose, which is completely glazed. The pilot is seated in a single-seat cockpit which, as in the related all-weather fighter, is faired into the fin by a dorsal spine. It appears that the glass-nose machine has one or two guns in the tail-end of the fuselage, remotely controlled by the pilot through a periscopic (or radar-laid) sight. The same region in the all-weather fighter seems to house an aft-looking radar.

Other new designs which were flown past the Western observers this year included three delta, or semi-delta, prototypes. Although these may well be pure-research aircraft, intended to prove new aerodynamic or operational features, they can certainly be discussed in this section.

All three of the new prototypes were ascribed to the now elderly Pavel Sukhoi. His terms of reference seem to have been "build three of the fastest machines you can, using one large, afterburning turbojet and employing various aerodynamic configurations." Best known of the trio is a machine about 50ft long with a 60-deg delta wing and with horizontal tail surfaces reminiscent of those of the Mig-19. One of the noteworthy features of this aircraft is the employment of a long, straight-through engine-air duct starting at a chin intake under a conical projection which no doubt focuses an inclined shock-wave on to the intake lip (as is done by the radome of the Vought Crusader, to choose a good Western counterpart). Other points worth commenting upon are the small notches at the trailing-edge roots, the plurality of pitot probes (or similar-looking devices) on all horizontal aerofoils and the considerable diameter of propelling nozzle, indicative of very high thrust.

The other two experimental machines from Sukhoi were a much stubbier version of the aircraft just described, with a ventral bulge like

that of the Super Farmer (which probably "area rules" the design), and a design very similar to the Convair F-102, with a stump of rear fuselage bearing a large triangular fin, half-way up which was mounted the small delta tailplane. Another machine seen at the Tushino fly-past this year was what seems to have been a one-off research aircraft using a wing similar in shape to that of the Super Farmer. It was, however, a much smaller aircraft and appeared to be designed to a less ambitious Mach number—perhaps 1.2, compared with 1.7.

Bombers. At the end of World War 2 Russia must have realized that her strategic striking aircraft were outclassed by those of the West, and her policy was "scrap the lot." To fill in the gap she did a very wise thing: several Boeing B-29s had force-landed near Vladivostok and in Manchuria after attacking Japan, and their advanced design so impressed the Soviet leaders that A. N. Tupolev was given the job of making a Chinese copy—if that is the right word. This he did to such effect that he won the Stalin Prize on the strength of it. The Tu-4, as the result was called, was put into production, together with its Wright R-3350 engine (redesignated ASh-90), and 1,200 Tu-4s remain in service to this day, chiefly employed as long-range crew trainers.

While the Tu-4 was filling the factories, Tupolev, Sergei Ilyushin, and other designers began to plan strategic bombers as ambitious as any then on the drawing boards in Britain or the U.S.A. Three of the designs have reached maturity, and are today in wide service with the Soviet Air Force. All three are superficially quite magnificent machines, and they uniformly employ swept and fenced wings of high aspect ratio and quite similar designs of fuselage terminated by a manned turret at the tail. The inclusion of a turret is strange in view of its weight penalty and doubtful value.

Easily the lightest of the trio is Badger, which is believed to be a Tupolev creation. In this rakish aircraft the wing-spar roots are formed into massive frames integral with those of the fuselage and encircling the large turbojet installations. The four-wheel-bogie main undercarriage units fold into nacelles which project behind the wing. The crew probably number six, with two pilots side-by-side, an electronics man behind them, a navigator in the amply fenestrated nose and a gunner in the blistered sighting station in a pressurized compartment just ahead of the tail turret (which probably houses twin 20 mm guns and incorporates radar gun-laying from a scanner just beneath the rudder). Although the airframe bears many points of obvious similarity to that of the slightly larger Tu-104 transport, the harder one looks the more one appreciates that virtually no components are common to the two airframes.

The Badger was first seen in 1954 and very many are now in service. It is certainly a potent weapon, and can probably be regarded as equal to the Valiant and rather better than the B-47 in most aspects of performance, although possibly not in operational effectiveness. Its range may be extended by air refuelling on the "buddy" system; at Kubinka airfield, some 45 miles west of Moscow, Western delegates saw two Badgers linked at their wing tips by a refuelling hose much after the manner employed by Flight Refuelling, Ltd. At least one Badger is also being used by the commercial operator, Aeroflot, to accelerate their jet-indoctrination and proving programme.

The other two bombers are both very large, four-engined aircraft. Of the pair the more formidable is code-named "Bison." It has four turbojets buried at the roots of the finely profiled wing, which is a remarkable structure with a high aspect ratio—particularly on the outer panels—and compound taper on both leading and trailing edges. Both on the wing and empennage sweepback is less acute than it is on the Badger.

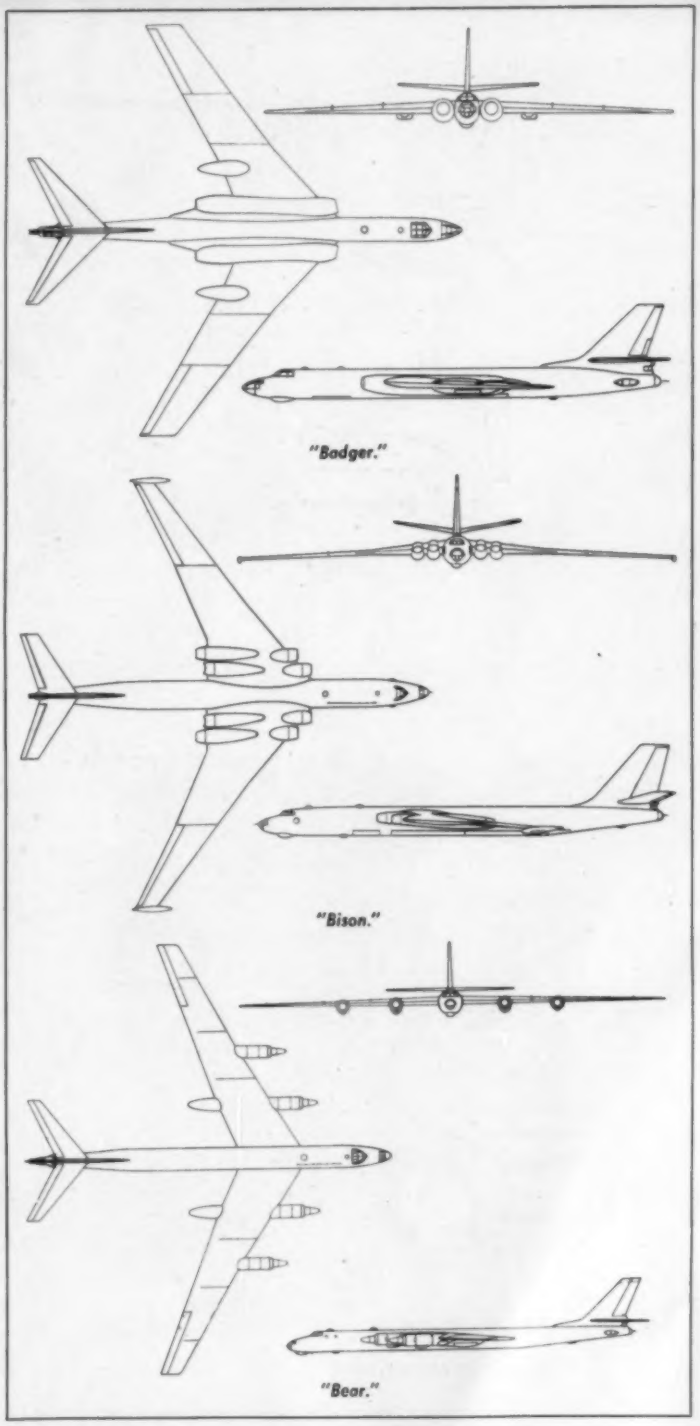
It is very likely that the Bison design is compromised in favour of long range and good performance at extreme altitude, so that considerations of induced drag outweigh those of speed or Mach number. Although the overall dimensions of Bison are rather less than was originally supposed, the weight is more than double that of Badger, and the turbojets of the Bison must therefore put out a total of at least twice the thrust of the twin-engined machine. A point of particular note is that the undercarriage is a tandem bicycle, with outrigger wheels in the tip nacelles. A single prototype was seen in 1954 and production machines are now in full service.

The third member of the triumvirate is code-named Bear, and is reported to be an Ilyushin design styled Il-38. From every point of view it is quite an aeroplane, and it is the only example in the world of a very long range turboprop bomber.

No details are known regarding the engines, beyond that they are almost certainly high-compression axials developing some 7,500 h.p. (if they are cleared for full-throttle operation at sea level) and driving eight-blade contra-rotating airscrews of some 18ft diameter. The achievement of bringing such a powerplant to the squadron-service stage is alone worthy of respect. The engines take in air through annular intakes behind the spinners and all four units seem to have twin jet pipes. Cowling diameter is approximately 61in.

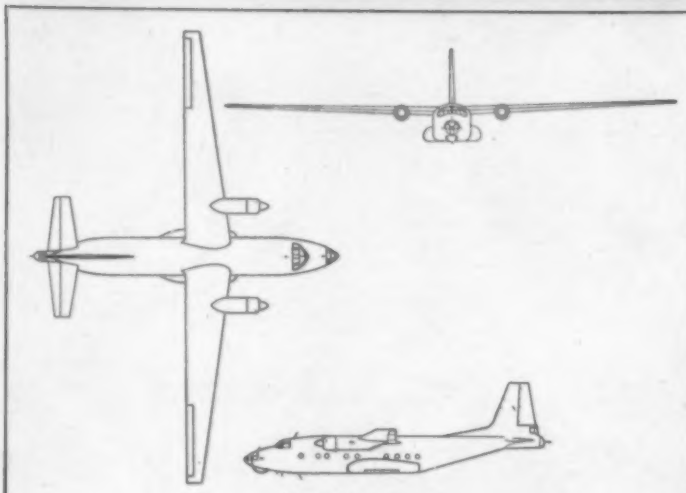
Bear has a tremendous wing with two degrees of sweep and enough interior fuel space for global range—no less than 8,000 miles according to an off-the-cuff Russian remark. The fuselage is quite different from those of the jet bombers in that it is a tube of quite exceptional length but relatively slim cross-section; indeed, were the aircraft not well proven one might question the torsional strength at the rear end. A conventional tricycle undercarriage is fitted, with the main bogies folding into voluminous extensions of the inboard nacelles. In flight Bear presents a most majestic aspect and its big turboprops have, in all their public appearances, run smoothly and quietly. Seven Bears were displayed in July last year and the type is now believed to be in full service.

The Russian air force and navy also operate a considerable number of light twin-engined bombers. The best known of these is probably the Il-28 which Ilyushin designed shortly after the receipt of Rolls-Royce Nene turbojets nine years ago. Some thousands—possible more than 5,000—must by now have been constructed in the Soviet Union and satellite countries. The majority are now probably used for second-line purposes, and special target-tug, dual-control trainer (with an additional cockpit in the nose) and freighter (with a belly pannier) versions exist. A civil variant is the Il-20, used by Aeroflot for express cargo services.

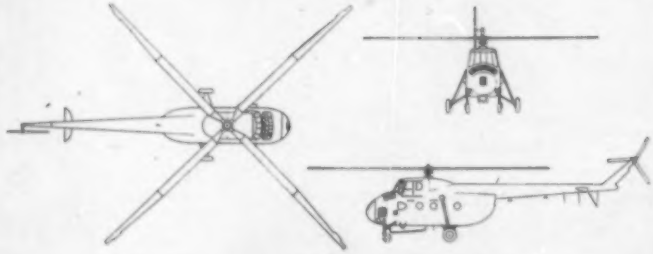


Similarly powered (one might say under-powered) by two VK-1 turbojets is the now-obsolescent Tu-14 naval attack bomber which has hitherto been styled "Bosun." It is a large all-unswept machine roughly similar to the North American B-45 in size and shape. Tupolev is also credited with various other small and medium-sized bombers of the 1948-52 era, together with at least one much larger, four-turboprop machine which was reported in 1952 to be in squadron service.

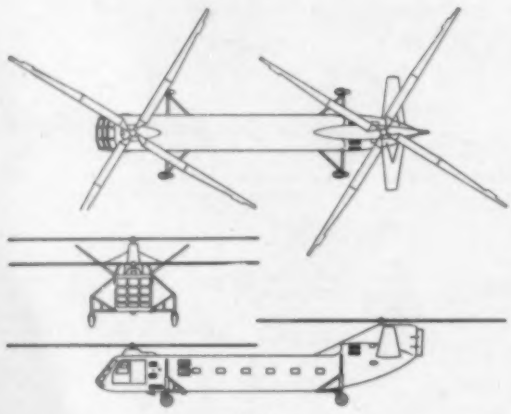
One of the most interesting aircraft which Western observers were allowed to see on the ground (from a distance) at Kubinka recently is a transonic (M = 1.2?) bomber. This machine apparently resembled the Canberra in some respects, having a mid-high (swept) wing with two large turbojets mounted well inboard on short stalks. It must have been about 80ft in length. It rejoices in the Western code-name of "Blowtorch." Also on view on this occasion was a twin-turbojet attack bomber capable of carrying a great variety of offensive stores, and a turboprop-powered naval anti-submarine machine which has been described as being very much like an enlarged, and much more rakish



Antonov prototype.



Mi-4.



Yak-24.

RED ROUND-UP . . .

and angular, Fairey Gannet. The engine was of approximately 4,000 h.p.

Other Types. New transport designs are being reported almost monthly. The large twin-jet Tu-104 (*Flight*, July 6, page 69) is now coming into service with Aeroflot and examples will no doubt be supplied to the military services. It is possible that this good-looking aircraft might make a useful tanker. Newer gas-turbine-powered transports include: a commercial and military-transport version of Bear, no doubt with a fatter fuselage, or a double-bubble; a four-turboprop machine resembling a slightly scaled-down Bear and furnished for 70 passengers on Aeroflot routes (this aircraft is reported to carry the designation Il-18, which in 1948 was applied to a transport design using four ASh-90 piston engines); and the mighty Tu-114 four-jet intercontinental liner which has been billed as providing accommodation for 180 passengers on two decks, and to cruise at 570 m.p.h.

Actually flown—no doubt in prototype form—at this year's Tushino display was a new design of military assault transport ascribed to Oleg Antonov (who was the chief designer of the AN-2 "outback" biplane transport described in our issue of July 13). Although its beauty is entirely functional, his new creation looks eminently sensible, resembling the configuration of the latest U.S.A.F. machines in the same class (C-130 and 133) on a rather smaller scale.

Power is provided by two trimly cowled turboprops which probably lie in the 4,000 h.p. class, driving four-blade single-rotation airscrews of about 16ft diameter. The wing is similar in form (on a similar scale) to that of the B-29, and the high aspect ratio (almost worthy of M. Hurel) and high-lift flaps no doubt allow it to achieve an excellent maximum lift coefficient. The fuselage is an ungainly, but capacious, box, with provision for heavy loading and dropping through a rear door system believed to be similar to that of the C-130. It is probable that the interior is pressurized. The front-end is typically Russian with a broad flight deck, a glazed nose for the navigator and a radar in the "chin" position. Extraordinarily enough the Antonov also has a rear gun turret, very similar to the pattern used on the big bombers.

At a guess the capacity payload should exceed 25,000 lb, and there is certainly room for upwards of 60 seated passengers. It is reported that a commercial version is under development for Aeroflot, and—as usually seems to be the case with this operator—it will carry only about half as many passengers as one might expect, in this case the reported figure being 24. Aeroflot are, however, expected to use the Antonov mainly on freight runs. One of its many advantages is likely to be good short-field performance.

Production of the familiar Il-12 and Il-14 transports clearly runs well into four figures: in fact Aeroflot are reported to have about 900 on charge at the present time and both designs are also widely used by the military services. Production is continuing on late-model -14s (Western delegates recently saw these aircraft being built in the old Plant 30, near Moscow) in both Russia and Czechoslovakia (*Flight*, June 1, page 689), and examples have been supplied to all Communist countries, Egypt and India. Present production is about four per day in the Soviet Union alone.

Helicopter development in Russia is no less vigorous than that of fixed-wing machines. Apart from numerous light, experimental creations the first really productive helicopter in Russia was—as far as is known—the Mi-1, by Mikhail Milla. This Sycamore-like machine, powered by a 540 h.p. ASz-21 radial, is widely used in all parts of the Soviet Union. It was described, and illustrated by a cut-away drawing, in our issue of April 20.

A substantially larger machine is the Mi-4, which bears superficial similarity to the Sikorsky S-55. Known in the West as "Hound" the Mi-4 is powered by a 1,000 h.p. ASh-62 radial mounted in the nose and driving the large four-bladed rotor via an inclined shaft. A particularly good feature of this helicopter is that—in certain versions at least—large clamshell doors are fitted at the rear of the capacious interior, which can seat 10 fully equipped troops. The Mi-4 was first seen in 1953 and is now fully operational in all parts of the Communist world including Arctic and Antarctic exploratory areas. It is the holder of several world records, typical of which are an ascent to 19,472ft with 4,400 lb payload and an average of 116.3 m.p.h. over a 310.7-miles circuit.

Largest of the Russian helicopters—in fact the largest rotary-wing aircraft in squadron service anywhere—is the Yak-24, previously known only as "Horse." This box-like, but effective, creation by the famous Yakovlev has a pair of ASh-62 radials driving tandem, interlinked, counter-rotating rotors of a design almost identical to that of the Mi-4.

The hull is built up as a metal framework, with unstressed metal skinning at the front and rear and fabric covering over the middle portion. The two pilots and radio operator are seated in the glazed nose, with access to the forward power compartment immediately behind, around which is a narrow passage leading to the unobstructed main cabin. The latter can accommodate as many as 40 persons, or three small M-20 Army utility cars, access for bulky cargo or vehicles being provided by a loading ramp at the rear end. The undercarriage and tail geometry is well shown in the three-view drawing, and it is instructive to compare the design with those of Hafner at Bristol and Piasecki at what is now the Vertol Corporation.

Design of the Yak-24 started early in 1954 and the first examples were seen at Tushino in July last year. Development must have been surprisingly trouble-free, since the type is already widely employed by the Soviet Air Force. At Tushino this year four Yak-24s and 36 Mi-4s demonstrated mass landing under difficult weather conditions; between them they disgorged 22 trucks which towed away 12 field guns and four multi-barrel anti-aircraft guns, together with no fewer than 175 soldiers. World records already ratified for the Yak-24 included ascents to 5,082 m (about 16,500ft) with two metric tons (4,400 lb) payload, and to over 2,000 m (6,560ft) with four metric tons. These figures cannot be approached by any helicopter at present in operational service in the Western world.

Designation or code-name	Powerplant Number, type and total thrust or e.h.p.	Dimensions (ft or sq ft) Span	Length	Wing area	Max. weight (lb)	Max. speed (m.p.h.)
Mig-15	One VK-1, 6,000 lb ...	33	36	190	14,300	670
Mig-17	One VK-1 devt., 7,500 lb ...	36	38	240	16,000	700
Mig-19	Two axial, 16,000 lb ...	34	45	249	20,000	850
Mig-21	One jet, 19,000 lb	34	51	255	22,000	1,100
Yak-25	Two axial, 16,000 lb ...	36	51	265	24,000	675
"S. Fish't"	Two axial, 20,000 lb ...	36	55	265	26,000	800
"Sukhoi-1"	One turbojet, 10,000 lb ...	22	45	166	13,000	1,000
Badger	Two turbojets, 36,000 lb ...	113	119	1,850	160,000	620
Bison	Four turbojets, 72,000 lb ...	168	163	3,170	352,000	610
Bear	Four turboprops, 30,000 h.p.	173	151	2,760	290,000	480
Il-28	Two VK-1, 12,000 lb ...	68	62	542	38,000	580
Antonov	Two turboprops, 8,000 h.p.	141	95	1,750	92,000	330
Il-14	Two ASh-82, 1,900 h.p. ...	104	69	1,000	40,000	270
Il-18	Four turboprops, 16,000 h.p.	?	?	?	?	?
Tu-104	Two turbojets, 29,800 lb ...	115	121	1,900	130,000	570
Tu-114	Four turbojets, 76,000 lb ...	?	?	?	?	?
Mi-4	One ASh-62, 1,000 h.p. ...	58	46	2,642	12,000	125
Yak-24	Two ASh-62, 2,000 h.p. ...	58	67	5,284	23,000	130

Notes: Figures in *italics* are estimated; wing areas are net; "span" for the helicopters (the last two aircraft) is main-rotor diameter.

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The routine scene: a "Flight" photograph taken at London Airport Central after the arrival of flight BE 919 from Glasgow last Friday evening.

B.E.A. DECADE

The Story of the Corporation's Ten Eventful Years

ON Wednesday last, August 1, British European Airways celebrated its tenth birthday. Ten years is not such a long time in air transport history and it has often been said that to be first means little; it is keeping ahead that is important. B.E.A. has over the last few years been particularly successful in this respect. The introduction of its Vickers Viscounts put the corporation well ahead of its competitors; and although the Viscount is now in operation with many airlines, B.E.A. has by far the largest Viscount fleet in Europe. Until very recently B.E.A. had the largest gas-turbine powered fleet in the world.

In addition to its ten years of operation as B.E.A., the corporation can legitimately claim 37 years of airline operating experience through its direct ancestors—B.O.A.C., Imperial Airways and the pioneer British airlines which began operation in 1919.

British European Airways Corporation was established under the Civil Aviation Act, 1946, on August 1, 1946, the day the Act received the Royal Assent, "with a view to providing civil air services in various parts of the world, and in particular, in Europe (including the British Islands)." This meant that under the Act B.E.A. was to be responsible for the operation of all scheduled air services within the United Kingdom and Northern Ireland and all British services from the United Kingdom to the continent of Europe. In fact this stipulation has since been modified and there are numerous independent airlines operating within the United Kingdom and between the United Kingdom and the continent.

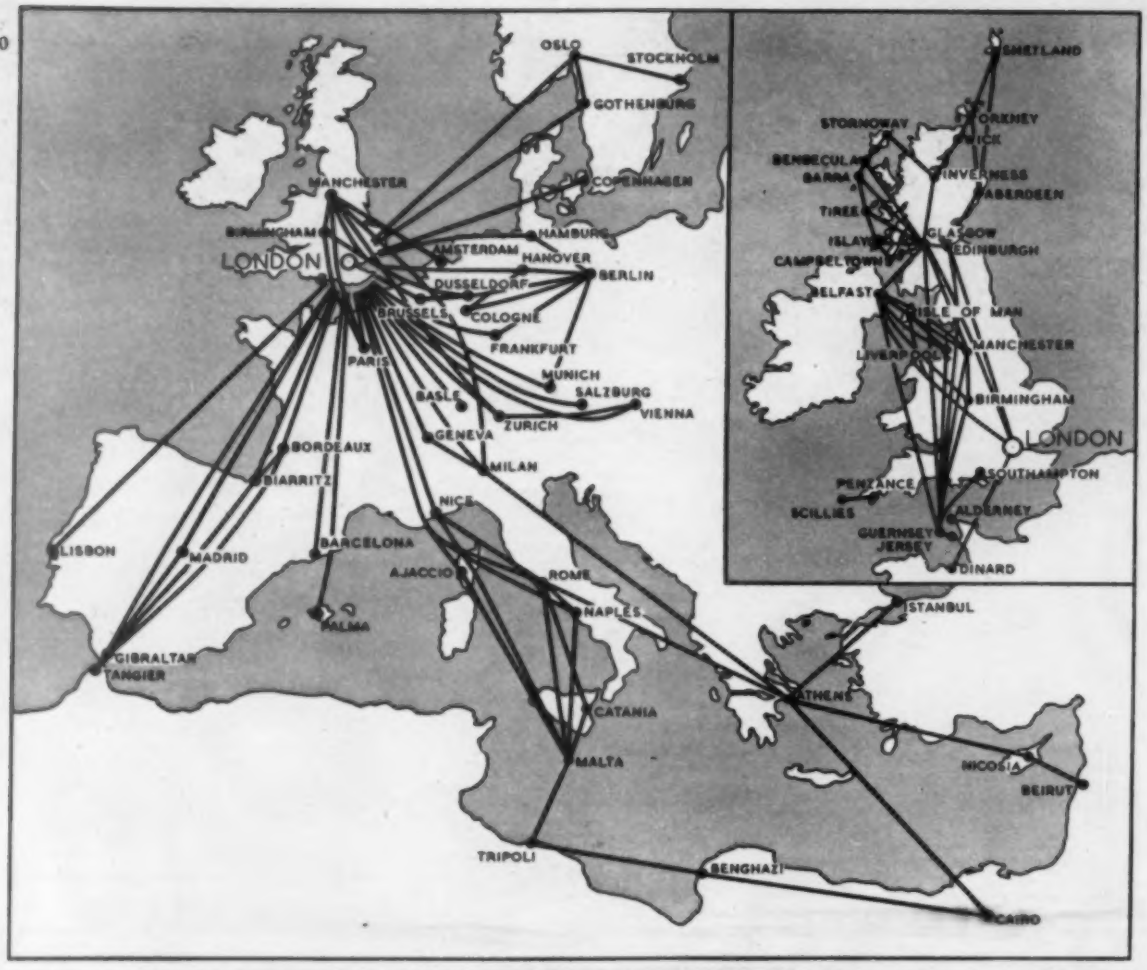
The original Board of B.E.A. consisted of Sir Harold Hartley (chairman), Mr. Whitney Straight (deputy chairman), Mr. Gerard d'Erlanger (managing director), W/C. A. H. Measures and Mr. I. J. Hayward. All were appointed from August 1, 1946. Subsequent additions to the Board that year were Sir Patrick Dollan and Mr. W. A. Edmenson, chairmen respectively of the Scottish and Northern Ireland Advisory Councils for Civil Aviation.

In anticipation of the passing of the Civil Aviation Act, a British European Airways Division of B.O.A.C. was formed on January 3, 1946, and that division took over the operation of the existing B.O.A.C. services to Europe and the non-military services operated between the United Kingdom and Europe by R.A.F. Transport Command. The B.E.A. Division began operating services from Northolt Airport on February 4, 1946. When the new corporation came into being it established its headquarters at Bourne School, to the east of Northolt Airport. Renamed Keyline House, this is still the corporation's head office.

On August 1, 1946, the new corporation took over a fleet of 20 C-47s (military version of the Douglas DC-3) from B.O.A.C., and these aircraft each had accommodation for 16 passengers, although on some routes the full complement could not be carried. Although it has not been possible to find confirmation that it operated as scheduled, the first B.E.A. service was timed to leave Northolt at 0840 on August 1 bound for Marseilles, Rome (night-stop) and Athens. At 0900 B.E.A. services were due to leave Northolt for Stockholm and Stockholm for Northolt, both *via* Gothenburg.

B.E.A. was unable to take over immediately the operation of British Isles domestic services, so for the time being these were operated on behalf of the corporation by the railway group of private airlines working together as the Associated Airways Joint Committee and by Allied Airways (Gander Dower), Ltd., and Channel Islands Airways, Ltd.

The routes operated by B.E.A. at its formation were: London-Paris (three flights daily); London-Brussels (twice daily); London-Amsterdam (twice on weekdays); London-Bordeaux-Madrid-



The domestic and international route-network of British European Airways as it was at the end of the Corporation's tenth year of operations.

B.E.A. DECADE . . .

Gibraltar (once weekly); London-Bordeaux-Lisbon (daily); London-Marseilles-Rome-Athens (once weekly); London-Copenhagen (four times a week); London-Gothenburg-Stockholm (daily except Wednesday); and London-Oslo (three times a week). In addition there was a once-weekly Stockholm-Helsinki connection for priority traffic, but this short-lived route was mostly operated by British independent companies under charter to B.E.A.

It was planned that as soon as possible B.E.A. should introduce the new 21-passenger Vickers Vikings on its routes, and the first service to be operated by this type was the London-Copenhagen service on September 1, 1946. The Viking used was G-AHOP *Valerie*, commanded by Capt. L. G. James.

On the same day B.E.A. opened a C-47-operated service to Berlin and the following day Vikings began operating to Amsterdam and to Oslo *via* Stavanger. Vikings started serving Stockholm *via* Gothenburg on October 6, and on November 1 they took over from the C-47s on the Lisbon, Madrid, Gibraltar and Prague routes, the last-mentioned having been opened on August 7.

It had been hoped that 31 Vikings would be in service by the end of 1946, but unfortunately all aircraft of this type had to be withdrawn on December 8 as a result of instability in icing conditions.

Thus B.E.A. was faced early in its existence with the now common problem of aircraft shortage. C-47s had to take over the entire operation of the corporation's services and this meant reduced frequencies and payloads as well as increased flight times. An unfortunate series of accidents to C-47s during the winter of 1946-47, though not involving B.E.A. aircraft, also had an adverse effect on B.E.A.'s traffic. A particularly severe winter also caused further troubles for the new airline. Maintenance staff worked under primitive conditions at that time and they suffered more than most. It is a tribute to those staff that the corporation did as well as it did in such a trying period.

1947. On February 1, 1947, B.E.A. began operating the United Kingdom services when it took up the activities of the A.A.J.C. companies, absorbing their staffs and adding their aircraft to its own fleet. The companies concerned were: Great Western and Southern Air Lines, Ltd.; Isle of Man Air Services, Ltd.; Railway Air Services, Ltd.; and Scottish Airways, Ltd. A number of other companies which were either non-operating constituents of those listed, or which had previously ceased operations, were

Some of the men behind B.E.A.'s first decade: (left) Mr. Peter Masefield, former chief executive, and Lord Douglas of Kirtleside, chairman. (Right) Mr. A. H. Milward, chief executive; W/C. R. A. C. Brie, in charge of helicopter development; and (extreme right) Sir Harold Hartley, the first chairman of B.E.A.

(Left) one of B.E.A.'s early fleet of Junkers Ju-52/3ms at Renfrew in August 1947. (Right) Another early type: one of B.E.A.'s Avro 19s seen at Ringway in 1947.

also taken over. The aircraft acquired comprised two C-47s, eight Junkers-Ju 52/3ms, 13 Avro XIXs, 39 D.H.89As, one Dragon and one Gipsy Moth.

The corporation's financial year ends on March 31 and by that date in 1947, after eight months' operation, 72,444 passengers had been carried plus 214 tons of excess baggage, 463 tons of mail and 606 tons of freight. The fleet had flown 22,753 hours with the load factor on international flights ranging from about 84 per cent in September to about 64 per cent in December. On the internal services in the two months they were operated by B.E.A. the load factor rose from about 32.5 per cent in February to about 46 per cent in March. Out of the 10,191 services scheduled, 8,417 were completed and the regularity percentage was 82.6. The corporation's financial loss amounted to £2,094,939.

On March 31, 1947, both Sir Harold Hartley and Mr. Whitney Straight resigned from the Board of B.E.A. to take up appointments with B.O.A.C. Mr. d'Erlanger then became chairman of B.E.A. with Mr. J. H. Keeling as deputy chairman and Mr. J. V. Wood as managing director.

On April 1 that year, B.E.A. took over the operations, staff and fleet of Channel Islands Airways and on April 12 the corporation took over the routes of Allied Airways and one of the company's aircraft. These aircraft acquisitions added seven D.H.89As to the B.E.A. fleet. The Vikings were re-introduced during the year and by March 31, 1948, the B.E.A. fleet comprised 35 Vikings, 27 C-47s, 39 D.H.89s, two Bell 47s, three Sikorsky S-51s and three communications aircraft—an Anson, an Auster and a Dragon. All the Ju 52s and Avro XIXs had been disposed of.

Two important events in August were the operation of the corporation's first scheduled all-freight service, from London to Brussels and Prague on the 10th of the month, and the first domestic Viking operation, from Northolt to Renfrew on the following day.

B.E.A. began pioneer work with helicopters at a very early stage in the corporation's existence and in July 1947 an experimental helicopter unit was formed at Yeovil under the control of W/C. R. A. C. Brie. Three S-51s and two Bell 47s were purchased and at the end of 1947 practice flights were begun in the west country prior to the operation of dummy mail schedules in that area. These dummy mail flights were begun on January 27, 1948, and continued until March 7.

1948. During its first full financial year of operations, April 1, 1947, to March 31, 1948, B.E.A. carried 511,522 passengers, flew 122,475,000 passenger-miles, 12,304,000 ton-miles, 96,442 aircraft hours, and achieved an overall revenue load factor of 62.3 per cent. The loss for the year was £3,284,282.

The story of B.E.A. has been one of steady growth with a continually growing route network, increased frequencies and improved aircraft. The development of the route pattern and increased frequencies is beyond the scope of an article of this length and details of some of the outstanding achievements and developments year by year must suffice.

In keeping with this statement it must be recorded that it was on June 1, 1948, that B.E.A. inaugurated the first public helicopter air mail service in the United Kingdom when the S-51 G-AKCU flown by Capt. Theilmann took off from Peterborough aerodrome, after receiving the Royal Air Mail Pennant, and flew to a dozen points in East Anglia before arriving back at Peterborough nearly 10 hours later. This daylight mail circuit was operated until September 25 that year, during which time 30,046 lb of mail was carried; 95 per cent of the scheduled flights were completed and 98.4 per cent of the scheduled calls were made.

It was also in 1948 that the Berlin air lift was brought into being to counter the Soviet blockade. B.E.A. acted as agent for the Foreign Office in administering the civil air lift which began on August 4. By the time the civil air lift ceased in 1949, aircraft of the independent companies concerned had flown 21,921 sorties, 59,796 hours and carried 146,980 tons. On October 17, 1948, B.E.A. carried its 1,000,000th passenger.

1949. During 1949 important management changes took place. On January 24, Mr. Peter Masefield joined the corporation as assistant to the chairman. On March 14 Lord Douglas of Kirtleside succeeded Mr. d'Erlanger as chairman and on October 17 Mr. Masefield became chief executive. Lord Douglas has remained chairman and Mr. Masefield was chief executive until late in 1955, when he resigned to become managing director of Bristol Aircraft, Ltd.

The corporation's figures for the year up to March 31, 1949, showed that 589,471 passengers had been carried, and that 155,028,000 passenger-miles had been flown, 13,218,000 aircraft miles and 11,541,000 revenue ton-miles. The overall load factor was 62.7 per cent and the financial loss was £2,763,085—still large but some £800,000 less than the previous year. Compared with the previous year, the cost of operation per capacity ton-mile had fallen by 20 per cent and the capacity ton-miles produced per employee had risen by 34.4 per cent.

Three other important events in 1949 were the introduction on May 29 of a £10 night return fare from London to Paris, the decision made on July 29 to order a fleet of Viscount V.701s and the introduction of helicopter-operated night mail services in East Anglia on October 17.

1950. In March the corporation installed its first aircraft maintenance dock at its Renfrew engineering base. This dock was used for C-47 check 4s and it led to the wide use now being made of much improved docks for Viscounts and Elizabethans at London Airport.

At the end of the financial year B.E.A. reported a loss of £1,310,822 which was slightly less than half of the previous year's loss in spite of increasing world costs. The cost per capacity ton-mile had been reduced by a further 26 per cent. During the year 1949-50 the fleet flew 110,700 revenue hours, carried 751,512 passengers for 213,810,000 passenger-miles, 5,440 tons of freight for 2,576,000 ton-miles and 3,721 tons of mail for 1,693,000 ton-miles. The passenger-miles and the ton-miles compared with the previous year were up 38, 29 and 47 per cent respectively. The overall load factor at 61.8 per cent was down 1.4 per cent.

On April 16 B.E.A. made its first scheduled flight from London Airport when a Viking left for Paris; on May 1 B.E.A., in conjunction with Swissair, introduced cheap night excursion fares on the London-Zürich and London-Geneva routes; and on May 6 B.E.A. operated its first scheduled service from Gatwick when a D.H.89A left for Alderney.

June 1, 1950, was an important day for B.E.A., for it was then the corporation inaugurated the world's first regular passenger service to be operated with helicopters. The route was between Cardiff and Liverpool with, from July 1, an "on demand" stop at

(Left) Saturday, July 29, 1950, 1248 hr: B.E.A.'s Viscount 630 taxies out at Northolt to take-off on the world's first passenger service (to Paris) ever flown by a gas-turbine-powered aeroplane. (Right) Two B.E.A. stalwarts: in the foreground is one of the "Pionair"-class reconditioned C-47s. Beyond is one of the Viking fleet which, after valuable service until the Viscount's advent, was retired in 1954.

(Left) One of B.E.A.'s handsome D.H.-Airspeed Ambassador "Elizabethan"-class airliners, which went into regular operation in March 1952. (Right) The departure of the last commercial service from Northolt, October 30, 1954.

B.E.A. DECADE . . .

Wrexham. The service was operated with S-51s, it continued until March 31, 1951, and carried a total of 819 passengers in 1,086 hours of flying.

Another pioneering venture took place on July 29 when the prototype Viscount V.630 began a period of regular flying on the Northolt-Paris service. This was the first operation ever of passenger services with a gas-turbine powered aeroplane. On August 15 the Viscount began operating for an experimental period on the Northolt-Edinburgh route, thus giving B.E.A. the distinction of being the first airline to operate both domestic and international services with a gas-turbine powered aeroplane. It was during this period, on August 3, that the corporation signed the contract for the supply of a fleet of 20 Viscount V.701 aircraft. Later an additional six aircraft were contracted for and later still a 27th Viscount was bought to replace an Elizabethan written off in a forced landing. It was in July, 1950, that for the first time B.E.A. earned more than £1,000,000 in one month.

1951. B.E.A. had for some time been having its C-47 fleet modernized. The flight deck was rearranged for two-crew operation, the passenger accommodation was increased to 32, the double freight doors were removed and a single downward-opening door with built-in passenger stairs was fitted. On January 24, 1951, the first of these aircraft, G-ALYF *Pionair*, made the first commercial flight by one of the reconditioned aircraft when it operated a charter from Northolt to Dublin. The modernized C-47 fleet is known as the Pionair class.

It was also in January, on the 7th and 8th, that B.E.A. extended its operations into North Africa. The Viking G-AJBV *Sir Henry Morgan* left Northolt just before dawn on the 7th and, flying by way of Nice and Rome, nightstopped at Malta. On the following day it continued its flight to Tripoli, Benghazi and Cairo. The Malta-Cairo section of the route was worked on behalf of the B.E.A. associate Malta Airways.

Results for the financial year up to March 31 showed a further reduced loss at £979,267. Traffic figures were: 143,800 revenue hours and 21.2 million aircraft miles flown, 939,586 passengers carried for 266,600,000 passenger-miles, 10,079 tons of freight and 5,249 tons of mail carried. Total ton-miles flown was 31,700,000. The overall load factor at 57.9 per cent was again down.

June 1 saw the official opening of a new B.E.A. helicopter service when two S-51s left Northolt bound for Birmingham. Public service was begun on June 4, the complete routing being London Airport-Northolt Airport-Hay Mills Rotorstation. The rotorstation was a small fenced-in area about three miles from the centre of Birmingham. It had two asphalt touch-down points, a small wooden traffic building, and was the first special helicopter station used by B.E.A. This service continued until April 9, 1952. For the first time B.E.A. carried one million passengers in a calendar year, the 1,000,000th being carried on July 5. In August the prototype de Havilland Heron was put into service for a short period on services between Northolt and the Channel Islands.

To gain operating and maintenance experience with the Rolls-Royce Dart engine before its entry into service in the Viscount, B.E.A. installed Dart engines in two of its C-47 freighters. The first service operated by one of these aircraft was that from Northolt to Bückeburg by G-ALXN *Sir Henry Royce* on August 15. This was the first freight service ever operated by a gas-turbine powered aeroplane. In October the corporation issued a specification for a large passenger-carrying helicopter. This was the first specification ever issued by an airline for such a machine.

1952. On March 13, 1952, B.E.A. operated its first scheduled service with an Airspeed Ambassador *Elizabethan* class aircraft—from London Airport to Paris. These new pressurized aircraft had been long delayed in entering service, but regular operation began on March 27 when two Elizabethan flights were begun daily in each direction on the London-Paris route. The services on March 27 were worked by G-ALZP *Sir Richard Grenville*. During the course of the year Elizabethans progressively took over the operation of many of the continental routes including those to Copenhagen, Stockholm, Milan, Zürich and Vienna.

The year's results to the end of March showed a loss of £1,423,611, due partly to increased costs, late aircraft deliveries and industrial disputes; 1,135,579 passengers were carried in the year as well as 12,500 tons of freight and 6,489 tons of mail. The overall load factor of 64.7 per cent was an 11.9 per cent improvement on the previous year.

June 16 saw the introduction by B.E.A. of its first *Silver Wing* lunchtime services between London and Paris and Paris and London. This service, with special lunch, has proved very popular and *Silver Wing* services have since been introduced on some other routes. It was a revival of the Imperial Airways' *Silver Wing* 12.30 service out of Croydon, begun with Argosy aircraft a quarter of a century earlier.

At the end of October the corporation introduced an £8 return fare between London and Edinburgh and Glasgow, and this had a marked effect on the traffic over those routes. In the same month the corporation carried its 5,000,000th passenger.

On November 11, in a kind of private Guy Fawkes' night, two B.E.A. aircraft, the Elizabethan G-ALZY *Sir Philip Sidney* and the Viking G-AHPM *Lord Rodney*, participated in a demonstration of Fido at Blackbushe, and invited passengers were carried. Also in November, on the 26th, B.E.A. made the first of its Royal flights when H.R.H. the Duke of Edinburgh flew from London to Malta in the Elizabethan G-AMAB *Sir Francis Bacon* commanded by Capt. W. Baillie.

1953. This was a most important year for the corporation, as it brought with it the introduction of the Viscount into regular service, and also the beginning of tourist fares on European routes.

On January 3 the flagship of the Viscount fleet, G-ALWE *Discovery*, was delivered, and on January 22 this aircraft set the first airline course records by flying from London to Cologne in 1 hr. 10 min 17 sec and returning in 1 hr 15 min 41 sec. The speeds were respectively 282.887 m.p.h. and 262.703 m.p.h. Subsequently Viscounts set many more airline course records for the corporation.

During the first half of February, B.E.A.'s helicopter unit took part in rescue operations in Holland following the flooding of large areas of the country as a result of the great gale.

At Wisley on February 11 the chairman of B.E.A. signed a £4,000,000 contract for 12 Viscount V.800 aircraft, and Lady Douglas named the first Viscount V.701 *Discovery*, after which it was again delivered to London Airport—making the flight in six minutes.

One of the Heron 1s used on Scottish ambulance services seen at Renfrew beside a Dragon Rapide, the type which it replaced on these duties on March 1955. Three Herons are now in service with B.E.A.

The Corporation's float-equipped S-55 lands at the South Bank, London, on the first helicopter service (now discontinued) from London Airport on July 25, 1955. These aircraft are now used on scheduled feeder services in the Midlands.

The annual report for the 12 months to March 31, 1953, showed a net loss of £1,459,131. In that year B.E.A. increased its revenue by £2,310,393 and reduced its operating loss by £86,334. Capacity ton-miles flown were 69.2 million with a load factor of 62.9 per cent; 1,400,122 passengers were carried and 172,273 revenue hours were flown.

April was an important month. On April 1 tourist class fares were introduced throughout Europe. On April 4 Viscount route-proving flights were begun with revenue freight. The first flight, over the London-Rome-Athens-Nicosia route, was made by G-AMOG *Robert Falcon Scott* with Capts. A. S. Johnson and W. Baillie.

Regular scheduled passenger services with Viscounts began on April 18 when G-AMNY *Sir Ernest Shackleton* left London Airport for Rome, Athens and Nicosia. Capt. A. S. Johnson was in command and Mr. George Edwards and Mr. Peter Masefield were among the passengers. By the end of the year Viscounts were operating to the following continental destinations: Istanbul, Zürich, Geneva, Copenhagen and Stockholm.

April 19 brought the introduction of summer schedules, and on that day Elizabethans began operating to Amsterdam, Brussels, Düsseldorf and Frankfurt. Waterloo Air Terminal was formally opened by the Minister of Transport and Civil Aviation on May 21. Further development in B.E.A.'s helicopter operations came about on Monday, July 13, when a regular freight service was begun between London Airport and Elmdon Airport at Birmingham. Bristol 171 helicopters were used and the first flight was made by G-AMWH *Sir Geraint* flown by Capt. J. Cameron.

During August 1953 B.E.A. carried for the first time almost a quarter of a million passengers in one month—in fact 248,000.

On July 17 a Viscount had operated a special London-Glasgow flight, making the journey in 1 hr 10 min. Regular Viscount operation on this route and on the London-Belfast route began on October 4 with the introduction of the first-class *Clansman* service to Glasgow and *Ulster Flyer* to Belfast.

1954. The year started with Viscounts taking over the operation of more routes, with consequent saving in flight times. On January 2 G-AMOL *David Livingstone* flew the first Viscount service to Madrid, G-AMOF *Sir Martin Frobisher* flew the first Palma service on January 10, and on January 13 G-AMOH *Henry Hudson* flew the first Barcelona Viscount service. On March 11 B.E.A. took delivery of its 20th Viscount, thus completing its initial fleet order for the type.

Financial results for the year ended March 31, 1954, showed that B.E.A. had made its first operating profit—£64,000. The net deficit was £1,773,797; 1,656,779 passengers were carried in the year and 53,594,689 revenue ton-miles flown with an overall load factor of 64.1 per cent.

On June 16, B.E.A. flew its first passenger services to be operated with a British helicopter when it opened Bristol 171 operated routes from London Airport and Northolt Airport to Southampton. G-AMWH was used on the first day and it was flown by Capt. R. W. Dibb.

The last of the corporation's services to be operated from Northolt Airport left at 18.58 on October 30. It was a Jersey service flown by the Pionair G-AHCZ *Charles Samson* (Capt. T. Froggatt). From October 31 all B.E.A. services to and from London used London Airport. On the same day all Viking and Admiral class high-density Vikings were withdrawn from B.E.A.'s regular services.

1955. B.E.A.'s first de Havilland Heron (Hebrides class) aircraft, G-ANXB *Sir James Simpson* was delivered on February 12. The first ambulance charter by this type was flown on March 4, and the two Herons were officially named in a ceremony at Renfrew Airport on March 18.

The corporation's annual report showed that for the financial year 1954-55 B.E.A. had for the first time made a net profit—it was £63,039. Traffic had increased 18.8 per cent in the year and 1,874,316 passengers were carried. The total revenue ton-miles flown was 63,646,902 and the load factor was 64.7 per cent compared with the break-even load factor of 64.5 per cent.

At a little after 07.30 on Sunday, April 17, the Viscount G-AMOA *George Vancouver* left London Airport for Amsterdam, thus giving B.E.A. the distinction of operating the first service from London Airport Central. On July 25, B.E.A. began the regular operation of passenger helicopter services between London Airport Central and the South Bank Heliport at Waterloo. Westland S-55s were used and the first service was flown by G-ANUK *Sir Kay*. The service was discontinued on May 31, 1956. On July 27, 1955, the corporation carried its 2,000,000th passenger to be flown in one year. A new route to Cairo was opened on August 8 when the Viscount G-AMOD *John Davis* flew the first service *via* Munich and Athens. On October 17, B.E.A., Vickers and Rolls-Royce jointly announced the Vickers Vanguard with Rolls-Royce Tyne engines.

1956. B.E.A. began this year by carrying its 1,000,000th Viscount passenger on January 2. Although the report for 1955-56 has not yet been published, provisional figures show that the corporation made a gross profit of £1,100,000 and a net profit of about £500,000. About a quarter of a million passengers were carried in the year ended March 31, thus making B.E.A. the biggest airline, from a traffic point of view, outside the U.S.A.

At March 31 the corporation's fleet consisted of 28 Viscounts, 19 Elizabethans, 38 Pionairs, eight Pionair-Leopard freighters, six D.H.89As, one Bristol 170, two Herons, two Bristol 171s, three Westland S-55s and one Bell 47.

On May 3, Mr. A. H. Milward was appointed chief executive and also a member of the Board. B.E.A.'s helicopter unit opened its latest service on July 2, with a route from Nottingham to Birmingham *via* Leicester. S-55s are used. Having previously made numerous Royal flights, on June 18, B.E.A. had the honour of carrying H.M. the Queen from Stockholm to London in a Viscount commanded by Capt. W. Baillie.

The latest events to record in this survey of B.E.A.'s 10 years occurred on July 20 when Lord Douglas of Kirtleside signed a contract with Vickers, worth about £20m, for a fleet of 20 Vanguards, 14 Viscount V.806s and two V.802s. On the same day Lord Douglas received on behalf of the corporation the Bristol 173 helicopter G-AMJI *Sir Bors* at a ceremony outside Keyline House. The Bristol 173 is to be used for experiments during the coming few weeks, and it is the first twin-engined helicopter to be used by an airline.

In its ten years of operation B.E.A. has become Europe's largest airline and has carried more than 12,000,000 passengers, produced 635,000,000 capacity ton-miles, flown 1,336,000 hours and earned £113,000,000 revenue. Its total of passenger-miles flown is 3,500,000,000.

(Below) The Corporation's Bristol 170 freighter. (Right) The Bristol 173, now undergoing evaluation trials in the hands of the Corporation's helicopter pilots. Taken over a fortnight ago, it is the first twin-engined helicopter ever delivered to an airline.

AEROBATIC CZECH

Handling the Zlin Trener 6

By DAVID F. OGILVY

ACCUSTOMED to the very limited and stereotyped aerobatic repertoire that one normally associates with typical British trainers such as the Tiger Moth and Magister, I viewed the prospect of flying and writing about a really fully aerobatic aeroplane with mixed feelings of enthusiasm and apprehension. I had seen the Zlin Trener put through the usual Continental manœuvres such as inverted climbs, bunts, inverted-return stall turns and all the fun of the fair, and I had enjoyed every minute of it. However, the worrying part was the realization that thousands of others had seen its capabilities too, and to present a true appreciation of the type I would be expected to make similar diversions from the straight and narrow path.

The Moravian Zlin 226 Trener 6 is the latest of a long series of similar designs which have followed a logical line of development along the years. Increased power and internal refinements are the main changes from its predecessors, the Z.22, Z.26 and Z.126. The Trener 6 depends for its performance on the Walter Minor 6-III, an inverted six-cylinder air-cooled unit claimed to produce 160 h.p. at 2,500 r.p.m. Technically, the aircraft itself offers nothing unduly startling, but everything seems to be in the right place and most parts that should be accessible are so. Of basic metal construction, the machine incorporates stressed-skin wings and fixed tail surfaces, but the fuselage has only fabric covering over the clearly-visible tube structure. This is perhaps my first point of criticism, for pupils' feet are clumsy—not only when in the air but also when blundering into and out of cockpits.

Cowlings and accessories are very neat and the engine is a tight fit, accessible through upward-hinged side cowls, while all other removable panels are of the customary stud-fastened variety. Fuselage inspection is via Auster-type zips, while sections of the wing leading-edge and other parts that should be looked into from time to time can be peered at by the removal of a few flush-fitting flat-headed screws.

The undercarriage, like all other components, is of very clean layout, the main legs being cantilever oleo units with faired upper struts with oil- and grit-protecting rubber hose over the extendible portions down to the wheels, which wear 420 × 150 Barum Aero covers. The legs are similar in track and angle of splay to those of the Moth Minor, which could be a source of some trouble when operating in training conditions from a cross-wind runway. The tailwheel unit, on the other hand, is highly commendable and steers with the rudder. It has more than ample damping through a strut boasting at least three inches of tube-extension, and the wheel carries a 290 × 85 anti-shim tyre, also by Barum.

Walking round the aeroplane on a form of pre-flight check, one sees other items of note, such as the combined pitot/static head under the port wing; an ingenious aerofoil mass-balance for the ailerons, mounted well below the control's c. of g., adjustable for position and therefore presumably for effect by a simple screw-thread; and large ground-trim tabs on the trailing edges of ailerons and rudder. In-flight trim, again provided by a tab mounted well behind the control itself, is available on the elevators only. Split, four-section trailing-edge flaps are fitted and there is also a very sturdy glider-towing attachment.

FOLLOWING its appearance in the British Lockheed Trophy aerobatic contest at Baginton on July 20 and 21, the Zlin Trener 6 OK-JEB was demonstrated at Elstree on July 22, by arrangement with the Association of British Aero Clubs and Centres. In these pages the manager and chief flying instructor at Elstree Flying Club describes his impressions of this lively visitor.

Fuel capacity varies from 115 litres (25 gal) in the touring Z.226B to 80 litres (17.6 gal) in the 226T. Fuel is carried in wing tanks, inboard of which on the port side is an oil tank of 11 litres (2.4 gal) with a cooling shutter controllable on the ground only. The seven-gallon hourly consumption of the Walter Minor 6 gives a reasonable endurance in either case.

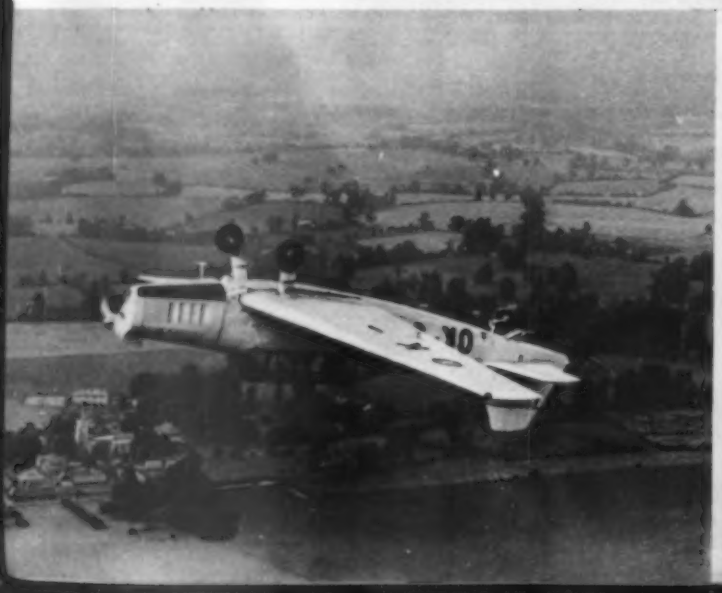
Access to the tandem cockpits is by a walkway on either wing, and although solo flying must be carried out from the rear seat, most controls are duplicated for use by either occupant. Layout in the front, from left to right, starts with the throttle and mixure controls (the former conforming to modern practice by running along a groove in the wall in the manner of a Meteor), below which is a friction nut and an elevator trimmer. The latter is a small wheel, very restricted in travel, stiff to move and far too sensitive for comfortable use. To the left of the seat is a lever for seat adjustment, a refinement rarely found on so small an aeroplane, while under the coaming on the same side we find the fuel selector control marked "Shut," "Tank" and "Reserve." A very adequate map-case is fitted to the cockpit wall, whilst on the facia before reaching the instrument panel we have the controls for the master switch, and navigation and instrument lights.

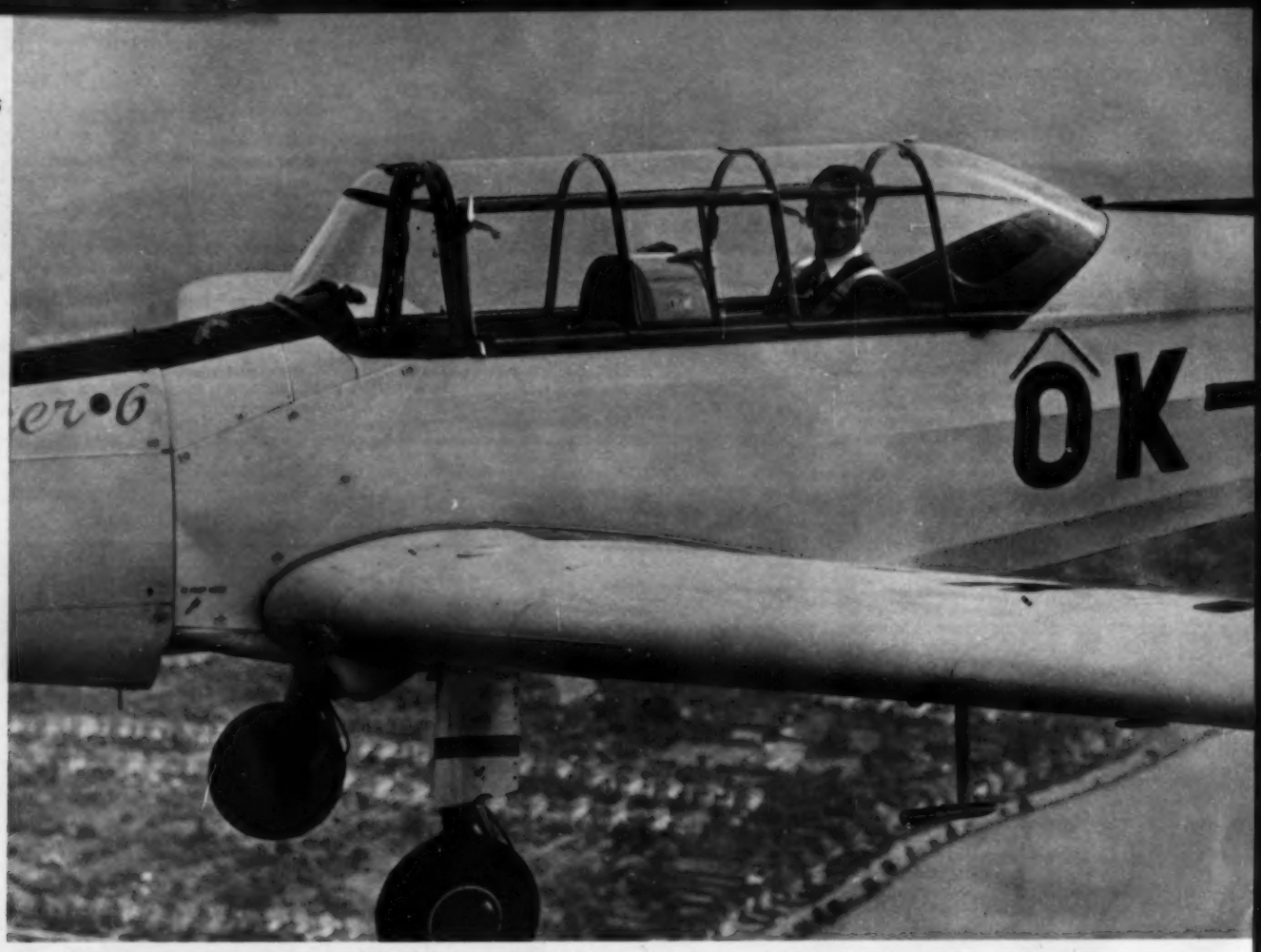
The instruments themselves are mounted on a well-damped panel that appears to be rather smaller than is standard British practice. With calibrations in metric figures the airspeed indicator and altimeter occupy the left side, next to which is an attractive and clear-reading American-type floating compass (with a grid ring for easy comparison between the selected heading and that actually being maintained). A turn-and-slip indicator, V.S.I. and rev. counter (the most compact I have ever seen) occupy the remaining three positions on the panel, and instrumentation is completed with a dial for oil temperature and a combined oil/fuel pressure gauge.

Starting is possible from the rear seat only, and the procedure is a trifle more complex than one expects with an elementary trainer. There is no parking brake, so the toe pedals must be kept depressed or chocks positioned; preferably, of course, both. The electrical master switch is kicked on with the right foot, fuel is selected "on" and pumped by hand from the tank to the engine, and then two or three shots are injected with the primer before the American-style ignition key is switched from 0 through 1, 2 to 1+2. By this stage, before opening half-an-inch of throttle and pressing the starter button, one is clearly reminded of the Harvard and the need for a third hand to deal with the wobble pump, energizing switch and other absurdities that seem necessary only on aircraft that play at being complicated.

A fire-extinguisher button, an electrical test panel for the generator, starter and instruments, and a three-position flap lever complete the rear cockpit's array of extras.

Recent appearances at Coventry (where Blaha came second in the Lockheed Aerobatic Trophy) and Elstree have demonstrated the agility of the Trener 6. In the four "Flight" photographs below, typical attitudes in a half-roll sequence are shown to advantage by the Czech pilot.





An impressive close-up by "Flight" photographer L. W. McLaren of Jiri Blaha flying the third prototype Walter Minor-powered Zlin 226 Trener 6.

Once started, the Zlin Trener feels right. The Walter Minor 6 idles at only 400 r.p.m. and does so with a smoothness that gives no sensation of a tendency to stall. The airframe, however, behaves like that of most small metal aeroplanes and suffers an annoying vibration transmitted to the hood and the instrument panel in much the same manner as the Chipmunk.

Taxying is delightfully easy, for the steerable tailwheel does all the work and even a strong beam wind loses its vicious nature, all weathercock tendencies being overcome before they are felt. The brakes, differentially operated from toe pedals, again bring to mind the Harvard, for they have no positive feeling of physical bite but nevertheless seem to produce the required results with regard to both direction and speed. Very little power is needed to maintain the forward roll, even on comparatively rough grass, but here the main undercarriage legs produce an Austerian clang —but without the intolerable jolts that normally go with it.

There are no checks peculiar to type that must be completed before take-off, for indeed the throttle friction-nut can be left loose without fear of detriment. With an aeroplane having a total weight of only 818 kg (1,800 lb) the surge of something approaching 160 h.p. produces an acceleration that would do justice to a fighter of a few years ago, while any pilot bred on the initial lethargy of a jet might wonder what to do next. Unfortunately, the rather excessively "springy" effect of the undercarriage gives the erroneous impression that at slow speeds the flying controls are not what they should be, for the aeroplane wallows on its wheels and the unstick lacks the brisk cleanliness that a harder-riding chassis provides.

However, once airborne at about 85 km/hr (53 m.p.h.) we reach the recommended climbing I.A.S. of 120 (75 m.p.h.) almost immediately, and to maintain that speed at full throttle the nose must be raised to an encouraging angle. As I had time for only

AEROBATIC CZECH . . .

one take-off and there were other points to seek, I was unable to measure the rate of ascent, but apparently full power is maintained all the way up and this gives about 2,300 r.p.m. and a maker's claim of 420 m (about 1,350ft) per minute.

I loathe light but ineffective controls and would always prefer something rather bargelike in weight but instant in response. With virtually no static friction in stick movement when on the ground the Zlin, I feared, might suffer from those painful umbrella-like ailerons that make the ride so uncomfortable in some ultra-light types. I was grossly mistaken, however, and glad to be so. Even at the comparatively modest airspeed for the climb the slightest pressure produced welcome results.

In level flight, of course, the controls were even better. Harmony is not perfect, and the ailerons are livelier than the elevators, while the rudder, with its area about twice that of the Chipmunk, cannot come into its own in anything other than aerobatic conditions. In normal turns I found a strong inclination to over-control at the back, whilst quick-change acts in reverse-direction steep turns initially caused disquieting wobbles, for the rate of roll permitted the change-over to be made with flick-like rapidity and my feet were always behind schedule in their share of the exercise.

Reluctant Wing-drop

At a reasonable height I stalled the Zlin. Full control remains on duty all the way down the speed range to 78 km/hr (48 m.p.h.) I.A.S., when a slight dropping of the nose is the only indication that something has gone slightly amiss. If a wing goes down too (and it is reluctant to do so), one has the choice of either rudder or aileron to put matters right. This is a good point aerodynamically and one reflecting sound qualities of design, but bad for a trainer, which should demand both positive and *correct* action at this stage.

With flaps lowered the stall is delayed down to an indicated speed of 65 km/hr (40 m.p.h.), and again any form of gesture with any convenient control will solve the student's most pressing problem. The spin, too, is not quite as honest as it might be, for I was recommended to heave the controls into opposite corners at an airspeed as high as 110 km. From this condition the result is most effective and the rate of rotation high, but again the effect is spoiled, for I had barely considered taking recovery action before everything was straight and level. To cut criticism quickly, the Trener not only allows the pupil to live after misusing the controls at low speeds, but barely makes him feel a fool; which is bad.

I spent very little time cruising, for there were other things to do. Nevertheless, I found that figures varied between 160 km/hr (100 m.p.h.) at 1,900 r.p.m. and 200 km/hr (125 m.p.h.) at 2,200 revs. Anywhere within this recommended range the aircraft would sit in position very happily, and the ease of control coupled with an excellent degree of visibility should make lengthy cross-country flights an attractive occupation for anyone.

For the aerobatically inclined, the Z.226 comes into its own. The plain loop is straightforward, but compares unfavourably with that of the Chipmunk. This surprised me, for although a dive to the recommended I.A.S. of 230 km/hr (143 m.p.h.) produced the right feel initially, some appreciable stick-load was required just before reaching the inverted position. I use the word "appreciable" only by comparison, for control forces are light at all times, but this seemed to be the least light of all. An additional 20-25 km/hr (12-16 m.p.h.) suffices for a roll-off and here one starts to benefit from the snappiness of the ailerons, which in themselves are the aeroplane's most praiseworthy possession. One can roll off gently with full feel of control all the way, or with the stick tucked into the cockpit corner the result must appear almost like a flick manœuvre. Again, I fear, the rudder seemed to give me a minor spot of trouble, but I am prepared to accept this as my personal responsibility.

Very few light aeroplanes roll pleasantly, and until making friends with the Zlin Trener I had always considered the Chipmunk to be almost alone in its ability to go all the way round in ease and comfort. However, here we really have something, for the Zlin's ailerons are the nicest that I have ever used and any form of rolling evolution can be carried out with a full degree of positive response under any condition. For something really slow, or of the hesitation variety, the ample supply of rudder that I have condemned in earlier manœuvres enables the nose to be placed anywhere in relation to the horizon, and this was well demonstrated by Mr. Blaha when he flew the Trener across Elstree aerodrome along the length of the runway but with about seventy degrees of bank.

If the human race had been intended to spend anything more than the shortest portions of its life inverted, I am certain that we would have been equipped with something other than a form of gravity-fed blood-pressure system, while our eyeball attachments would be stressed for tension as well as compression loads. Perhaps Mr. Blaha has been "modded" accordingly, for after take-off on one demonstration he casually rolled the Zlin onto its back and climbed round the circuit that way to nearly two thousand feet. There he stayed for a while before rolling out, giving the impression that he was testing the machine to find out whether *it* would work the right way up, too.

A few seconds upside down are enough for me, and I say this in no way derogatory to the Trener, for it handles equally well either way up. Although essentially a believer in light aeroplanes, I was bred on heavier equipment and have never really overcome the temptation to make a slow roll a quick one. However, there is nothing to compare with an occasional degree of rashness, and at a suitable height I stopped holding things into the cockpit wall and let the machine ride inverted for a while. It rode well, remarkably well, but apart from a craving to see *terra firma* where it belonged—beneath rather than above—I had been unable to secure the harness quite as tightly as I would have liked, and man and machine began to part. With a tight harness, a nice day and a spot of practice, I feel that the Zlin could do most pilots a lot of good.

Much of the credit for the outstanding excellence of Mr. Blaha's performances is due to the behaviour of the Walter Minor engine. Unfortunately, there is a momentary cut whenever loads are reversed, but as soon as the carburettor comes into action again there is a smooth feeling of plenty of available power. The technical design of the layout is not quite perfect, for throughout any inverted flight full fuel-pressure is maintained regardless of the throttle position. In other words, only the air is controlled, with the result that as the lever is closed the fuel/air ratio becomes top heavy and everything goes a little rough.

After a high-pressure session of aerobatics that could be continued *ad infinitum* without any loss of height, I lowered OK-JEB a few feet into the circuit and prepared for landing. The split four-section flaps can be extended at about 130 km/hr (80 m.p.h.) and the speed over the fence maintained at 120 (75 m.p.h.) I.A.S. This seemed a trifle fast, especially when the stall occurs at little over half this figure, but perhaps my adviser had decided that I should play safe with his valuable possession.

The use of flap causes only a very minor trim-change and the approach, like that of the Chipmunk, is not quite as steep as it should be. Again, like so many other light types, the trim range is not quite adequate, for a slight backward stick pressure is required all the way in.

Landing is quite easy. The comparatively flat approach and the well-extended tailwheel make the round-out to the three-point attitude a comparatively gentle exercise, and the movement required is about the same as on a Magister when not using flaps. The touchdown, like the unstick, is not as solid as I would like, but against this one must credit the undercarriage with damping all shocks long before they reach the cockpit. This applies even on really rough and uneven ground. The toe-brakes, of course, are a matter of habit.

Conclusions

Any assessment of an aeroplane must be a critical one, and intentionally I have not spared the words when harsh ones were needed. I hope the impression gained of my feelings is not in any way derogatory, for from a purist's flying angle I enjoyed every second from the time I entered the cockpit to the time I stepped out. It is from the operator's viewpoint, considering the Zlin as a training aeroplane, that any guns were fired; for, as always seems to be the case, the most pleasant aeroplanes to handle are frequently not the best for their specific jobs.

To be quite frank, I am very impressed by the Z.226 as a flying machine and would own one if given the chance, but (as with so many elementary trainers) it is too easy to fly. I place our Chipmunk in the same category, for both suffer from an innocuous stall and a reluctance to spin; both are too easy to land; and both could easily lead to over-confidence with certain types of pupil. The tendency to put even an inexperienced pilot into an aerobatic attitude of mind may well be a good one, but how much more a student appreciates his limitations when struggling to roll a Tiger Moth or Magister. The latter is certainly not so pleasant to fly as the Zlin, but it drops a wing at the stall, spins honestly and will groundloop on the unwary. That makes it a good trainer.

Functionally I have few objections to the Zlin. Quite inexcusable, however, is the absence of a parking brake; starting is unnecessarily complicated and cannot be carried out by both instructor and pupil; and I should have given preference to either an artificial horizon or directional gyro rather than an oil temperature gauge. On the credit side, however, the cockpit is much neater and more comfortable than that of the Chipmunk, the view is better, the controllable tailwheel saves considerable use of brakes and the consequent tendency to nose-over, and the excellent power/weight ratio makes "time to height" something virtually to be ignored when planning the length of a lesson. The main feature, of course, is the ability to continue functioning when inverted, a characteristic that no British designer has contrived since pre-war days.

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(Top) "Valerie" ready to take off for Copenhagen, on the inaugural BEA Viking flight. 1st September, 1946.

(Above) Passengers for Paris boarding the Viscount 630 at London Airport, July 1950, on the first scheduled BEA Viscount flight.

(Extreme right) The new Vickers Vanguard, scheduled for BEA operation in 1960.

(Right) The first Viscount 800 which will shortly be entering service with BEA.

service, BEA Viscounts have flown 1,334,000 passengers a total of more than 24,113,000 miles.

This month a larger, more powerful Viscount, the "800", makes its debut. It arrives, appropriately, on BEA's 10th Anniversary.

Also appropriate is the news that BEA have just signed a contract for 20 Vickers Vanguard propeller-turbine airliners—still larger, faster and more versatile—which will continue the BEA story of comfort and economy in the 1960's.

(*Courtesy: "Flight"*)

Vickers-Armstrongs

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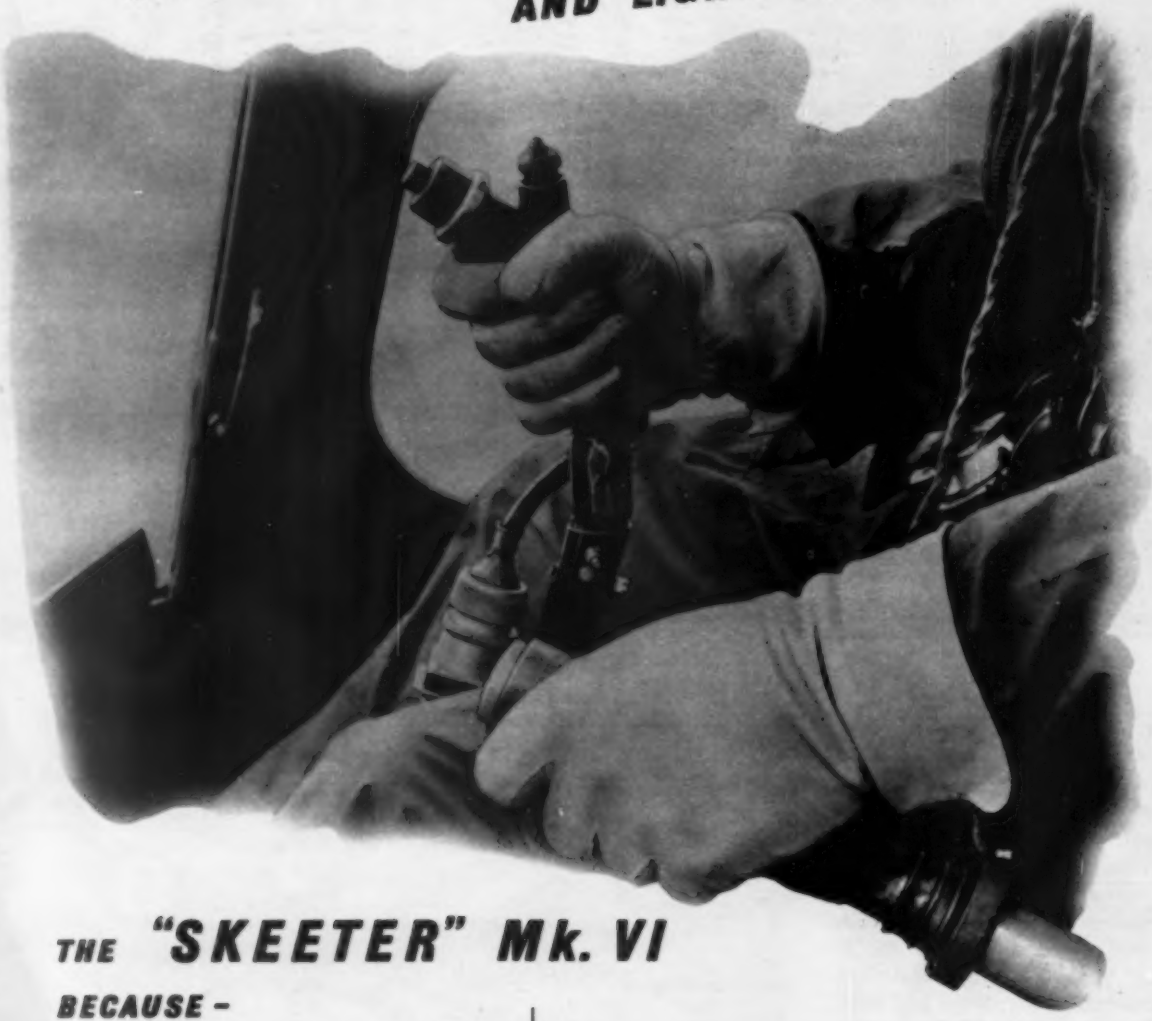

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These are some of the features of the Skeeter helicopter which commend it for its chosen duties. Each of them contributes towards the economy which is a feature of its initial and operating costs.

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SEEN AT ST. YAN

Notes on Sailplanes and Equipment at the World Gliding Championships

(Left) The German Ka2B Rhönschwalbe, with swept - forward wing. This machine was entered by Turkey in the two-seater class at St. Yan.

IT is not at all certain that the pilot of the most efficient sailplane will be the winner of a championship. Other factors such as piloting skill, weather and luck are as important. Nevertheless, the fact is that the majority of the sailplanes seen at this year's World Gliding Championships in France were quite new since the 1954 Championships, and several other types had been modified since then. Many were prototypes and unlikely to go into production, but most designers were presumably hoping that their machines would seem to be worth their cost.

High performance demands high aspect-ratio and light weight. High performance at low speeds and while circling is not compatible with low sinking speeds at top speeds unless flaps or jettisonable ballast are employed. Safe landings and very low drag can both be obtained only by retractable wheels or skids. Many sailplanes aiming at very high performance thus tend to become expensive in comparison with the "classical" designs common in Great Britain.

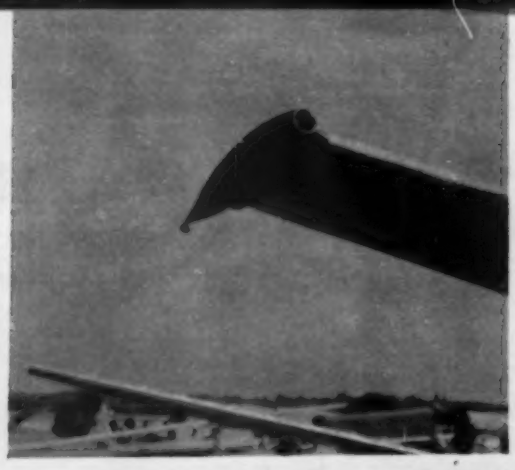
The four British designs (Sky, Skylark 3, Olympia IV and T.42) were very successful. They are of wood and fabric construction and, aerodynamically, have progressed from the twenty-year-old Olympia only in general cleanness and (on the Skylark, Olympia IV and T.42) in changing the wing profile to a laminar-flow section. They already cost well over £1,000 which, in a gliding movement which receives no subsidy, is quite enough to have to pay.

At the other extreme, we have sailplanes like the Yugoslav Meteor. This was designed by Obad, Cijan and Mazonec and sponsored jointly by the Yugoslav Government and the national Aero Club. The construction is all-metal, and the magnificent wing finish indicates the use of large and expensive jigs. The large landing wheel is retractable, as is the front skid.

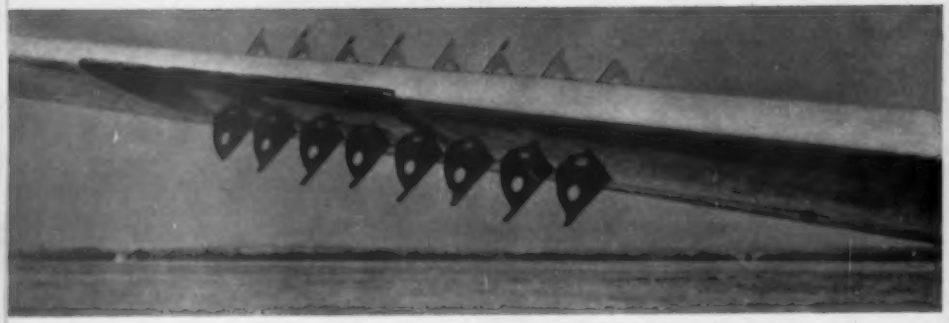
The Meteor wing-section is laminar, 16½ per cent thick with a 1½ deg washout, and is disturbed only by dive brakes fitted well towards the trailing edge and by full-span flaps of small chord. The chord of the flap proper varies from four to six inches and of the aileron from six to nine inches. The basic wing-section is slightly cambered, but a downward flap deflection increases the camber for circling and for landing. For very-high-speed flying, even the basic camber leads to high drag, and a small *upward* deflection is used to improve performance. The elevator and rudder both have horn balances, and longitudinal trimming is obtained by a variable incidence tailplane. Two Meteor prototypes have been built, and the measured performance shows a maximum gliding-ratio of more than 40. The cost, however, is at least three times that of the British machines.

Two sailplanes which performed well were the Polish-built Jaskolka single-seaters and Bocian two-seater. These have many expensive devices such as flaps, slotted ailerons, sliding hoods, retractable wheels, water-ballast tanks—and even navigation lights and static-discharge wicks! Nevertheless, the price of the single-seat Jaskolka is quoted as only £1,250—kept low, perhaps, by

Exotic front-ends: (top to bottom) the Jugoslav Meteor; the Polish Jaskolka Z and the Czechoslovak VSM.40 Démant, both fitted with sliding canopies; and the Hungarian Z.08.



Wing and tail details: (far left) Fowler flaps, dive - brakes and ailerons on the Czechoslovak L.13; (left) Jaskolka tip-fairing, with navigation light and static-discharge wick; (below, left) fan-type spoilers on Eolo 3V.1 (Italy); (below) swept fin and rudder of Swiss Elfe M single-seater.



quantity production in a country of large-scale gliding.

The Czech sailplanes, too, were lavishly built. The single-seater VSM Démant was built in wood and had an excellent finish. It had all the expensive aids such as flaps and retractable wheels, and was beautifully instrumented. The Czech two-seater L.13 was nicknamed "Cadillac" as a tribute to the luxury of its fittings. Aids to flying included neat Fowler-type flaps, and the cockpit was so delicately upholstered that it was difficult to realize that the construction was all-metal.

The Austrian designer Herr Musger had conceived the Mg.23 and the two-seater Mg.19c much more in the classical tradition. Great attention had been paid to aerodynamic cleanness, especially at the wing roots. Two of the German machines had also been produced without expensive gadgets. Hanna Reitsch's Zugvogel, with its slightly swept-forward wing, had a flat-sided fuselage as had the two-seater Bergfalke II. This two-seater has a welded tubular-steel fuselage-frame and is offered for sale at the very low price of £836. A gliding ratio of 29 is claimed.

Equipment. Oxygen and radio equipment are almost essential in a championship meeting. The British and several other machines were equipped by Normalair and Pye respectively with light-weight equipment which worked well. Both firms sent representatives to the Championships, but no real attempt seemed to be made to boost this excellent British equipment before the wide international audience. At the OSTIV congress there was a paper praising the very much heavier German radio equipment, but nothing from Britain. Many overseas buyers are interested in our gliding equipment, and it is a pity that we do not seize every opportunity to publicize it.

SEEN AT ST. YAN . . .

All competitors look to the British team to produce some new instrument for a World Championship. The total-energy variometer, which we first used in Spain in 1952, has been developed further by a device fitted to Philip Wills' Skylark 3 and explained to OSTIV by Frank Irving. The rate-of-climb indicator is normally connected between a reservoir and a source of pressure which gives static pressure less the dynamic head, i.e., $p - \frac{1}{2}\rho V^2$. The venturi needed to produce this pressure protrudes into the air-stream, where it may get iced up. Wills' sailplane was fitted with a reservoir having an elastic wall. Pitot pressure, $p + \frac{1}{2}\rho V^2$, was applied outside the wall and the consequent variation in the reservoir capacity gave the same effect when used with a normal static vent as the ordinary total-energy venturi system. The old pitot and static tubes have now vanished from the exterior with consequent improvement in drag, icing liability and appearance.

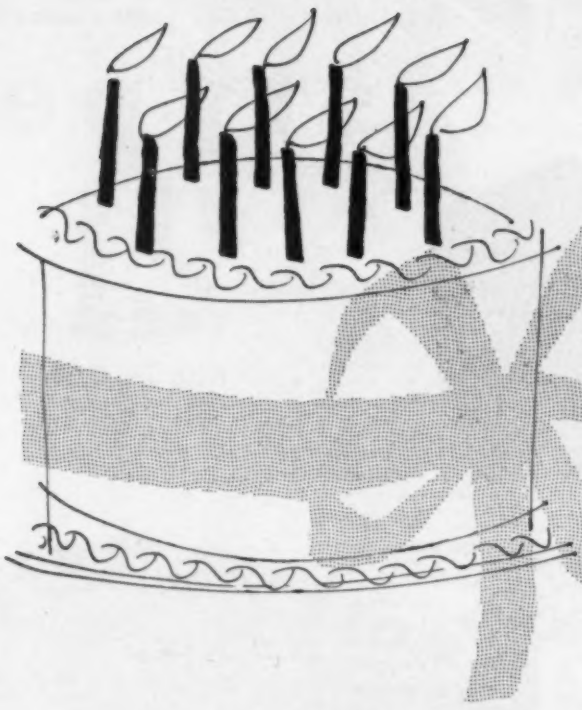
The Cook compass, with its excellent damping, was used on one occasion by Wills to fly through a cloud in close proximity to a mountain face. Such confidence is tribute enough. "Thermal-snifters" which, two years ago, were thought to be the next real pilot aid, were not in evidence. They were based on the assumption that thermals were warm. OSTIV learned from the meteorologists that they are sometimes colder than the air around them! No wonder the instruments did not function very well.

A.H.Y.

(Far left) Cockpit of the Elfe M. Note central controls and best - gliding - speed calculator.

Left, front cockpit of the L.13 two-seater, with "Cadillac-type" facia and fittings.

Right, a spade grip was fitted to the Jugoslav Meteor's control column.



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To all who have made our tenth birthday such a resounding success, we say again: *"Thank you"*.

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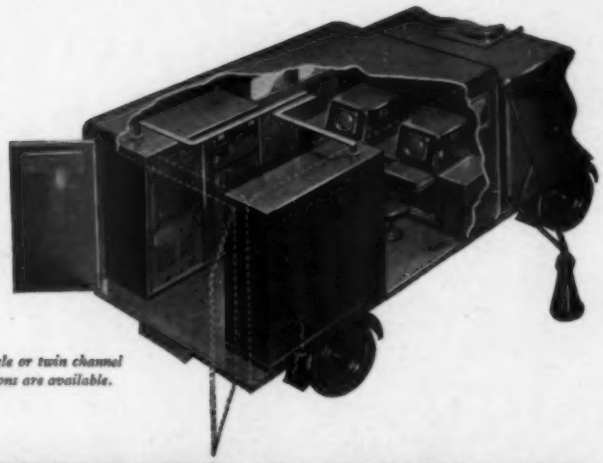

Either single or twin channel installations are available.

To be shown at Farnborough this year — a new Cossor high-power S-band surveillance radar, complete and self-contained in a single trailer. The Type 21 is a high-definition radar with a vertical coverage of 0-45° without beam tilting or switching. Moving target indication is provided and is fully controllable. Anti-rain facilities, including circular polarisation, are provided. All equipment is shock-mounted for rough terrain, and the cabin accommodates two operators and a technician. Peak power: 500KW.

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(Left) This Bell P-39Q-10 won the piston-engine section of the Thompson Trophy in 1946. (Right) Coonley Special, in the 1947 Goodyear.

AIR RACING in the U.S.A.

*History of the National Contests: Part 2**

By PETER M. H. LEWIS

THE world had been at peace for just a year when the Nationals returned in 1946. As many changes had taken place in aircraft design and powerplants during the intervening years, new methods had to be devised for racing a fresh generation of aeroplanes for the benefit of the public.

During 1945 a number of interested mid-Westerners had gathered in Cleveland to combine their ideas and the Air Foundation of Ohio was the outcome of this meeting. A non-profit-making organization, it came into being to promote aviation in all its aspects, one of which was air-racing. The new association accordingly helped to organize the first post-war Nationals, held from August 30 to September 2, and staged once again at Cleveland.

Circumstances had indeed changed from the time the last contests were held and yet, in several ways, an obvious repetition of those of the early 1920s could be discerned. Four and a half years of war had taught many more people to fly and available to them were vast stocks of war-surplus aircraft. A few pre-war racers had survived to be made airworthy again but the 1946 programme did not cater for them and a further year was to pass before they took part.

Another parallel was evident in the great increase in speed brought under the impetus of war and in the return of strong Service participation, represented by jet aircraft.

The two pre-war classic Bendix and Thompson races were reintroduced, with both reciprocating "R" and jet "J" divisions in each. The long-distance Bendix was held over a 2,048-mile course from Van Nuys, Cal. The "R" Thompson called for ten laps of 30 miles while the "J" section of the race required seven laps of the same triangular course.

The expected efforts were made by the entrants of the piston-engined machines to get the maximum out of their Airacobras, Kingcobras, FG-1s, Lightnings and Mustangs, and they resorted to the usual methods of hotted-up engines, polishing, fairing, lightening and the reduction of wing areas. All excess military equipment, of course, had been removed. Qualifying trials were run off during the week before the races, which were held in conjunction with the celebration of Cleveland's Sesqui-Centennial.

The Standard Oil Company of Ohio awarded their Sohio Trophy for a 240-mile race to commemorate the anniversary, and a women's race for the Halle Trophy was flown by AT-6s and SNJs. B-80A-1s competed in straight speed dashes over one mile for the Weatherhead Trophy.

Jacqueline Cochran, Earl Ortman, Tony LeVier, Steve Wittman and Paul Mantz were there to show that they had not lost their pre-war racing skill, and the film stunt-pilot Mantz won the first of what were destined to be three consecutive Bendix wins in his red P-51C Mustang. The ex-fighter showed its range and speed to be ideal for the long-distance event, taking the first four places. Two out of the four Bendix "J" P-80s finished and fifteen of the twenty-two "R" class which started were home within the time limit. A racehorse start was a feature of the "R" class in the Thompson.

Cleveland was chosen again in 1947 and the city was the focal point for the Nationals from August 30 to September 1. The races were now well established again after their wartime dormancy, and Air Foundation had the previous year's experience to assist in organizing the show and framing the rules.

Additional events were the Kendall for Mustangs, the Tinnerman for Kingcobras and the Allison for jets—P-80As—which flew from Cleveland to Indianapolis and returned.

The needs of the low-powered, inexpensive racer were at last recognized by the award sponsored by the Goodyear Corporation. Aircraft for this event had to be built to very exacting standards of design and safety with an Approved Type Certificate engine for power. Capacity was limited to 190 cu in, and the Continental C-85 became virtually the only engine suitable. Fixed undercarriages were stipulated, together with adequate pilot's view and minima of 500 lb weight and 66 sq ft wing area. William Brennand won the first contest with the Wittman *Buster* rebuilt from the old *Chief Oshkosh*. Other old-timers modified to meet the new specification for midgets were Art Chester's *Jeep* and Ralph Bushey's Brown B-1 Special from the 1930s. Thirteen entries were received for the first year.

Paul Mantz flashed over the line in his Mustang only 78 seconds ahead of Joe DeBona for his second Bendix triumph. Casualties were heavy that year. At the end of the races, one pilot had been killed and several others injured, together with nine aircraft destroyed and several damaged.

**Part 1 appeared in "Flight" for July 20.*

Reading downwards: The Wittman Special "Buster" in the 1947 Goodyear, with Steve Wittman (left) and pilot Bill Brennan; LeVier and Associates' "Cosmic Wind," flown in the 1947 Goodyear by H. R. ("Fish") Salmon, now Lockheed chief engineering test pilot; and the North American AT-6A, flown by Betty Clark in the 1947 Halle Trophy.

(Above) Art Chester's famous "Swee' Pea," with butterfly tail and airscrew-spinner air intake. (Right, reading downwards) The Hurlburt Hurricane, Curtiss XP-40Q-3 and LeVier "Little Minnow." All these aircraft competed in 1947, and in 1948 "Fish" Salmon won the Goodyear with the last-named.

AIR RACING IN THE U.S.A. . . .

Cleveland was selected once more for the 1948 Nationals from September 4 to 6. The usual events were listed, and good support came for the Goodyear midgets class with 24 entries, out of which nine won through to the final. An unfortunate occurrence was the Gee-Bee crash which killed Paul A. de Blois during its tests. The miniature racer had been built by the son of the late Zantford D. Granville, designer of the earlier Gee-Bees.

Paul Mantz brought off his third consecutive Bendix win but at a lower speed. The Navy's VF-51 squadron competed for the jet division of the long-distance classic from Long Beach, Cal., in FJ-1 Furies. The same unit flew for the Indianapolis to Cleveland Allison Trophy.

Ten finalists started for the Thompson and only three finished, the rest gradually retiring as the laps mounted.

Another year passed and Cleveland was the home for the 1949 National Air Races from September 3 to 5. Service participation was still strong and the U.S.A.F. was able to show its new Thunderjets and Sabres to the crowds. The Bendix entrants were given a racehorse start, the first arrival being the winner, which turned out to be Joe DeBona's Mustang. The Thompson "J" proved a great strain on the aircraft over a closed course and was considered unsuitable for further open competition. The Thompson course was shortened to 225 miles in place of 300 miles and, at the start of the "R" division, the spectators were shocked to see Bill Odom's fatal crash in his Mustang fitted with wing-tip radiators. The National Guard were newly equipped with Shooting Stars and flew them from Indianapolis to Cleveland for the Allison Trophy.

The midget racers, for the third and final year of Goodyear sponsorship, were well to the fore in numbers. Thirty-nine entries were received and, out of 25 starters, ten finalists were left after the heats and the semi-finals. The 1947 winner, William Brennand, repeated his success with *Buster*.

1950 was the first year, apart from the war period, when the Nationals were not held. The fatal crashes of the past few meetings had raised doubts about the advisability of continuing to race with modern high speed aircraft. This was especially true of closed-course events with their dangers of low-altitude pylon turns.

The Continental Motors Corporation had agreed to take over the sponsorship of the midgets for a three-year term and their challenge trophy was competed for at the Detroit International Air Fair. John Paul Jones was the winner at 187.78 m.p.h. in *Little Toni* over the finals' course of twelve laps of two miles. An unfortunate incident was the fatal crash of J. Vosyka during the third elimination heat. The Professional Race Pilots Association sponsored the Art Chester Memorial Trophy Race and this was won by Robert Downey at 187.990 m.p.h.

Air Foundation and the Aero Club of Michigan brought the Nationals to life again at Detroit in 1951 at the National Air Show from August 17 to 19.

The Bendix Trophy was awarded for a straight speed dash by jets from Edwards Air Force Base, Muroc, Cal., to Detroit, a distance of 1,919 miles, and the Allison for jets flying to Indianapolis and back again to Detroit. The Thompson Trophy was given to Col. Fred Ascani for his 100-km world record attempt at 628.69 m.p.h. and he also received the Allegheny Ludlum award. As pylon racing was banned except for the midgets the normal Thompson race could not be held, so the trophy was presented for the record attempt, for which special permission had been given. The fourth race, which the U.S.A.F. flew, was the speed dash from Chicago to Detroit over 257 miles.

The sole civilian event consisted of the Continental Motors Trophy Race for the midgets, and John Paul Jones in *Shoestring* won for the second consecutive year, with an increase of 10 m.p.h. in his speed.

The year 1952 was a bleak one for American air racing. Air Foundation was not tempted to organize the Nationals but the midget race took place for the Continental Motors Trophy. The finals were held at Detroit during the fifth International Air Fair

Two 1949 entrants, the clipped-wing Bell P-63C-5 (Thompson Race) and Martin B-26C (Bendix Race).

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Two handsome Goodyear F2G-1s which competed in 1949: No. 57 was third in the Thompson Trophy "R" (reciprocating-engine) Race and the other, flown by Cook Cleland, was the winner.

AIR RACING IN THE U.S.A. . . .

from August 30 to September 1 and the winner was Steve Wittman in *Bonzo* at 197.29 m.p.h.

Next year, 1953, was celebrated as the 50th anniversary of powered flight and Dayton, Ohio, the home of the Wright brothers, was chosen as the venue for the newly-named National Air Show. Air Foundation joined with the Dayton Chamber of Commerce in organizing the display (which also marked Ohio's Sesqui-Centennial), staging it from September 5 to 7.

For the first time, the Bendix was won at more than 600 m.p.h., over 1,868 miles from Edwards Base to Dayton. The Thompson Trophy was again awarded for a simulated 100-km world record attempt, the speed for this run being 681.576 m.p.h. The Allison award went to Capt. Forrest Wilson for averaging 537.802 m.p.h. from Indianapolis, in a Thunderjet.

The race for the midgets was not held during 1953 as a sponsor was not forthcoming to support the class.

The main series was continued in 1954 at Dayton's James M. Cox Municipal Airport from September 3 to 6, once more under the guidance of Air Foundation and the city's Chamber of Commerce. The customary jet races for the Bendix and Thompson awards were staged, with an increase in the winning speed of each, the latter prize again being given for a new 100 km world

RESULTS OF THE MAIN EVENTS, 1920-1955

Year	Race	Pilot	Aircraft	Speed (m.p.h.)
1920	Pulitzer	Capt. C. C. Moseley	Army Verville-Sperry	178.000
1921	Pulitzer	Bert Acosta	Navy Curtiss Racer	176.7
1922	Pulitzer	Lt. R. L. Maugham	Army Curtiss R-6	206.000
	Mitchell	Lt. D. F. Stace	Thomas Morse MB-3	—
1923	Pulitzer	En. A. J. Williams	Navy Curtiss R2C-1	243.67
	Mitchell	Capt. B. E. Skeel	Thomas Morse MB-3	146.45
1924	Pulitzer	Lt. H. H. Mills	Army Verville-Sperry	215.72
	Mitchell	Lt. C. K. Bettis	Curtiss PW-8	175.45
1925	Pulitzer	Lt. C. K. Bettis	Army Curtiss R3C-1	241.695
	Mitchell	Lt. T. K. Matthews	Curtiss PW-8	161.5
1926	Mitchell	Lt. L. G. Elliott	Curtiss R-1	160.438
1927	Pantages	Lt. T. P. Jeter	Boeing FB-5	177.040
1928	Mitchell	Lt. E. H. Lawson	Curtiss P-1A	154.743
1929	Mitchell	Lt. J. A. Woodring	Curtiss P-1A	158.96
	Thompson	Douglas Davis	Travel Air Mystery S	194.00
	Cleveland	Henry J. Brown	Lockheed Air Express	156.20
1930	Thompson	C. W. Holman	Laird Solution 300	201.91
	Chicago	Wiley Post	Lockheed Vega	—
1931	Bendix	J. H. Doolittle	Laird Super Solution	223.038
	Thompson	Lowell Bayles	Gee-Bee Z	236.239
1932	Bendix	J. Haizlip	Wedell-Williams 92	245.000
	Thompson	J. H. Doolittle	Gee-Bee R-1	252.686
1933	Bendix	Roscoe Turner	Wedell-Williams 2	214.78
	Thompson	J. W. Wedell	Wedell-Williams 44	237.952
1934	Bendix	Douglas Davis	Wedell-Williams 44	216.237
	Thompson	Roscoe Turner	Wedell-Williams 57	248.129
	Greve	Lee S. Miles	Miles and Atwood	—
1935	Bendix	Ben O. Howard	Howard Mr. Mulligan	238.704
	Thompson	Harold Neumann	Howard Mr. Mulligan	220.194
	Greve	Harold Neumann	Howard Mike	—
1936	Bendix	L. Thaden-B. Noyes	Beechcraft C-17R	165.32
	Thompson	M. Detroyat	Caudron C-460	264.261
	Greve	M. Detroyat	Caudron C-460	247.300
1937	Bendix	Frank Fuller	Seversky S-2	259.242
	Thompson	Rudy Kling	Folkerts FK-1	259.910
	Greve	Rudy Kling	Folkerts FK-1	232.272
1938	Bendix	J. Cochran	Seversky P-35	249.774
	Thompson	Roscoe Turner	Laird-Turner L-RT	283.419
	Greve	Tony LeVier	Rider-S't Firecracker	250.886
1939	Bendix	Frank Fuller	Seversky S-2	282.098
	Thompson	Roscoe Turner	Laird-Turner L-RT	282.536
	Greve	Art C. Chester	Chester S50 Goon	261.390

Year	Race	Pilot	Aircraft	Speed (m.p.h.)
1946	Bendix 'R'	Paul Mantz	N.A. P-51C-10	435.501
	Bendix 'J'	Col. L. Gray	Lockheed P-80A-5	494.779
	Thompson 'R'	Alvin Johnston	Bell P-39Q-10	373.908
	Thompson 'J'	Maj. G. Lundquist	Lockheed P-80A-1	515.853
	Sohio	Dale Fulton	N.A. P-51D-30	352.781
	Weatherhead	Lt. W. J. Reilly	Lockheed P-80A-1	578.360
	Halle	Margaret Hurlburt	N.A. AT-6	200.588
1947	Bendix 'R'	Paul Mantz	N.A. P-51C-10	460.423
	Bendix 'J'	Col. L. Gray	Lockheed FP-80A-5	507.255
	Thompson 'R'	Cook Cleland	Goodyear F2G-1	396.131
	Thompson 'J'	Lt.Col. R. L. Petit	Lockheed FP-80A	500.704
	Sohio	Tony LeVier	Lockheed P-38L-5	360.866
	Allison	Capt. R. A. Bernor	Lockheed FP-80A	494.277
	Kendall	Steve Beville	N.A. P-51D	384.602
	Tinnerman	Ken Knight	Bell P-63A	352.168
	Goodyear	William Brennand	Wittman Buster	165.857
	Halle	Ruth Johnson	N.A. AT-6	223.390
1948	Bendix 'R'	Paul Mantz	N.A. P-51C-10	447.980
	Bendix 'J'	En. R. E. Brown	N.A. FJ-1	489 526
	Thompson 'R'	Anson Johnson	N.A. P-51D	383.767
	Sohio	R. I. Eucker	Bell P-63A	320.220
	Allison	Lt. L. B. Thompson	N.A. FJ-1	491.000
	Tinnerman	Bruce Raymond	N.A. P-51D	362.245
	Goodyear	Herman R. Salmon	C.W. Little Minnow	169.688
	Kendall	Grace Harris	N.A. AT-6	234.960
1949	Bendix 'R'	Joe DeBona	N.A. P-51C	470.136
	Bendix 'J'	Maj. V. A. Ford	Republic F-84E	529.614
	Thompson 'R'	Cook Cleland	Goodyear F2G-1	397.071
	Thompson 'J'	Capt. B. Cunningham	N.A. F-86A	586.170
	Sohio	William Odom	N.A. P-51C	388.393
	Allison	Lt. W. C. Crew	Lockheed F-80C	594.800
	Tinnerman	Ben McKillen	Goodyear F2G-1	386.069
	Goodyear	William Brennand	Wittman Buster	177.340
1950	Continental	John P. Jones	C.W. Little Toni	187.785
	Art Chester	Robert Downey	C.W. Minnow	187.990
1951	Bendix 'J'	Col. K. K. Compton	N.A. F-86A	553.761
	Thompson 'J'	Col. F. J. Ascani	N.A. F-86E	628.698
	Allison	Lt. W. D. Baisley	Republic F-84E	580.512
	Continental	John P. Jones	Ast. Bros. Shoestring	197.218
	To Detroit	Capt. O. J. Reichman	N.A. F-86E	672.180
1952	Continental	S. J. Wittman	Wittman Bonzo	197.290
1953	Bendix 'J'	Maj. Wm. T. Whisner	N.A. F-86F	603.547
	Thompson 'J'	Br.Gn. J. S. Holtoner	N.A. F-86D	681.576
	Allison	Capt. F. Wilson "	Republic F-84G	537.802
	Gen.Elec.	Capt. H. E. Collins	N.A. F-86D	707.889
1954	Bendix 'J'	Capt. Ed. W. Kenny	Republic F-84F	616.208
	Thompson 'J'	Capt. E. P. Sonnenberg	N.A. F-86H	692.820
	Allison	Lt. Wm. J. Knight } Lt. Wm. K. Sellars }	Northrop F-89D	00:02:07
	Gen. Elec.	Maj. J. L. Armstrong	N.A. F-86H	649.460
1955	Bendix 'J'	Col. C. M. Talbott	N.A. F-100C	610.726
	Thompson 'J'	Col. H. A. Haynes	N.A. F-100C	822.135
	Allison	Webb Air Force Base	Lockheed T-33	00:11:33
	Gen. Elec.	Maj. L. J. Stevens	Boeing B-47	589.294

Venues: From 1920 to 1930 the races were held at a variety of places, as recorded in the article; from 1931 to 1936 they were staged variously at Cleveland and Los Angeles; in 1937-39 and 1946-49 Cleveland was the venue; and Detroit was chosen in 1950-52; Dayton in 1953-4 and Philadelphia in 1955.

(Top) Two British-built entrants in 1949, a Mk 25 Mosquito (placed 4th in Bendix) and a Mk 18 Spitfire. (Right centre) "Beguine," the North American P-51C, with wing-tip radiators, in which Bill Odom was killed in the 1949 Thompson Trophy. (Right) "Shoestring," which won the 1951 Continental Motors Race. (Above) Thompson "J" winner in 1951 was Col. F. J. Ascani's F-86E

AIR RACING IN THE U.S.A. . . .

record established on September 3rd. To demonstrate the aircraft the record attempt was simulated for the spectators on September 6th.

The Allison Trophy required a 10,000-ft climb in an interception exercise by a pilot and an observer and this height was reached by an F-89D in 2 min 7 sec. General Electric donated a trophy for a 500-km closed-course record attempt which was made at 649.46 m.p.h. with a Sabre flown by Maj. J. L. Armstrong.

For the second year in succession, the midget racers were unable to take to the air as there was no sponsor willing to take on the event.

After two years at Dayton, the National Air Show was taken to Philadelphia, Penn, for the first time since 1926. Three days, September 3-5, 1955, were set aside for the races and Air Foundation ran the big show with the assistance of the local Chamber of Commerce.

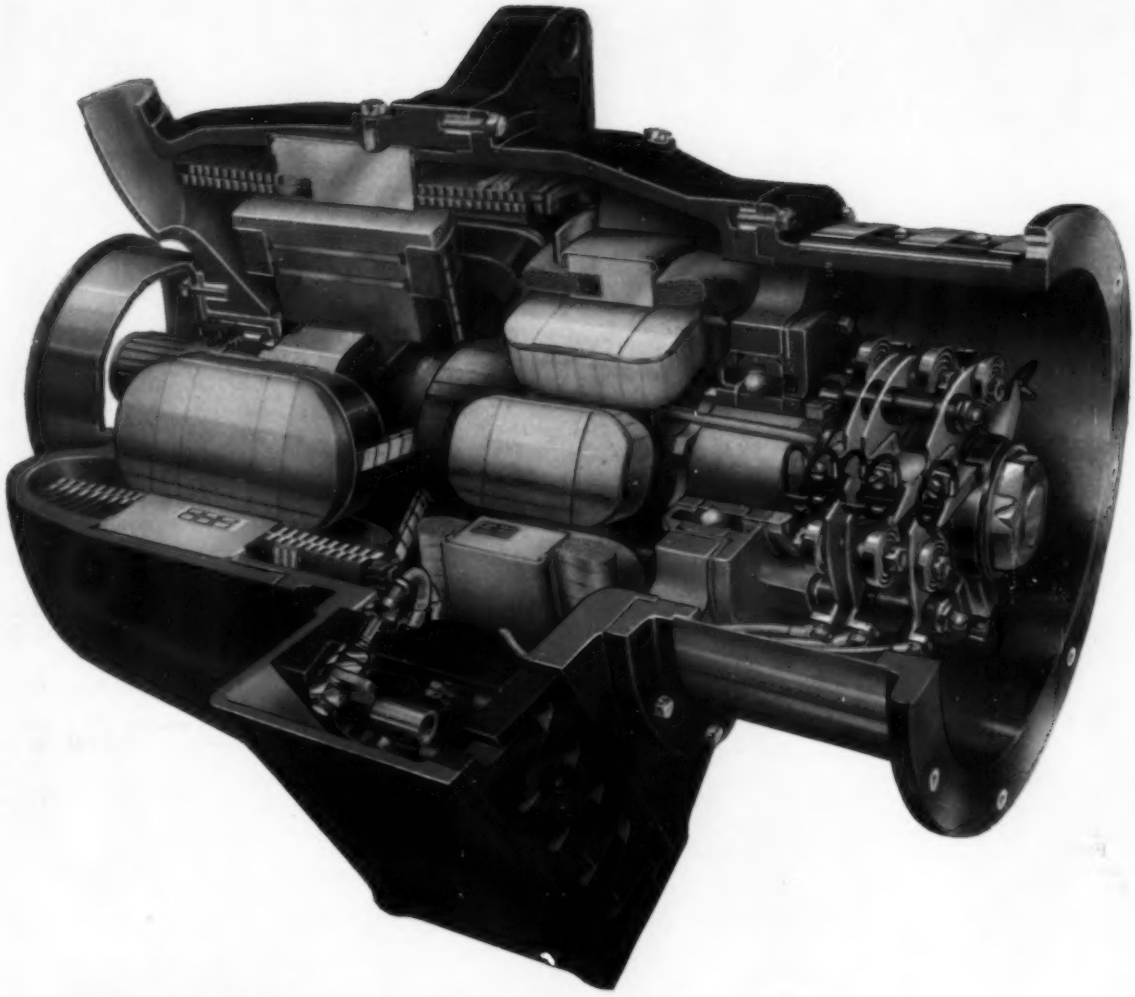
Take-off point for the Bendix Jet Speed Dash was George Air Force Base, Cal., and Col. Carlos M. Talbott's F-100C Super Sabre covered the 2,324.9 miles at 610.726 m.p.h., ahead of the five other entries from the 450th and 479th Day Fighter Wings. The Thompson Trophy was awarded for a world speed record attempt over 15-25 km at 30,000-35,000ft on August 20 under the new F.A.I. rules. Col. Horace A. Hanes flew a Super Sabre over the course at 822.135 m.p.h. and demonstrated the machine in fly-pasts during the show period. To provide a new interest for the spectators, six crews competed for the Allison Trophy by changing the J33-A engine as quickly as possible in a Lockheed T-33 trainer. Three B-47s flew from March Field, Cal., for the General Electric Trophy, the winner covering 2,337.4 miles of the race at 589.294 m.p.h. Supporting thrills for the visitors included aircraft being catapulted from U.S.S. *Ticonderoga*, helicopter demonstrations and aerobatics by the crack U.S.A.F. Thunderbirds and the U.S.N. Blue Angels teams.

The midget racers were once again unable to compete owing to the unavailability of a sponsor for them. After such a promising start, it will be a great disappointment if the class disappears for this reason, leaving the home-builders without any showing.

The American Air Races have provided an annual mirror of the advance of aviation for many years, from early days to the present. Throughout, the story has been one of enthusiasm and courage, coupled with enterprise and adaptation to meet the ever-present technical progress. It cannot truly be said that the races have resulted in any outstanding contribution to the evolution of the aeroplane, but they have at least served to satisfy the sporting needs of both the competitors and spectators.

The author wishes to acknowledge assistance given by Messrs. C. S. Logsdon, director of the contest division, National Aeronautic Association; Benjamin T. Franklin, general manager, National Aircraft Show; and W. A. Mara, director of advertising and publicity, Bendix Aviation Corporation.

Winners, prizes and presidents: (left) Veteran Paul Mantz congratulated by Malcolm P. Ferguson, Bendix President, on winning the Bendix Trophy for the third year running. (Centre) The Bendix Trophy, Mr. Ferguson and Capt. E. W. Kenny, 1954 winner. (Right John Paul Jones, pilot of "Shoestring," receives the Continental Trophy from C. J. Reese, company president.



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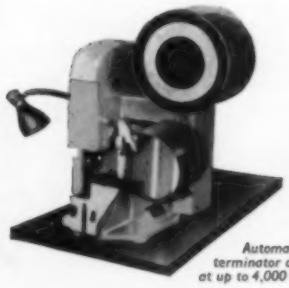

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AP323-14

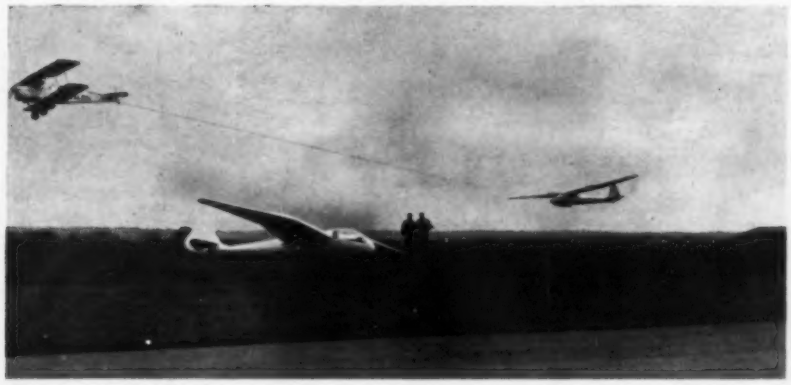
A HELICOPTER GARDEN PARTY...

THE fine grounds of Dunsborough House, Ripley, Surrey, were placed at the disposal of the Helicopter Association by Mr. and Mrs. Charles Hughesdon for a "helicopter rally" last Saturday. Threatening weather, which later cleared, failed to discourage over 300 visitors, some of whom arrived in half a dozen helicopters. These consisted of two Dragonflies (respectively operated by Westlands and Mr. Richard Fairey) and four Sycamores (variously from Bristols, B.E.A.—one brought the chairman, Lord Douglas —and R.A.F. South Cerney). B.E.A.'s Bristol 173 also appeared, but did not land, and after tea the Westland Widgeon dropped in. In the group above are (left to right) Mr. Charles Hughesdon—who was a racing pilot in pre-war days—Mrs. Hollis Williams, her husband (Westland's technical director) and Mrs. Hughesdon (Miss Florence Desmond, the actress).

"Flight" Photographs of Two Week-end Events with the Accent on the Social Side

...AND A GLIDING "AT HOME"

AT Lasham Aerodrome, Hampshire, some 200 members and guests attended last Saturday's At Home organized by the Surrey Gliding Club group. In the photographs below Frank Irving in the Imperial College Skylark 2 is preceding his aerobatic display with a demonstration run in the low-tow position behind a Tiger Moth, with Slingsby Petrel in foreground; while (right) the visitors included Mr. F. N. Slingsby, Mrs. Beswick, Mr. Frank Beswick, M.P., and Sir Alfred Le Maitre.



The Waterton Story

"The Quick and the Dead," by S/L. W. A. Waterton, G.M., A.F.C. and Bar. Frederick Muller, Ltd., 110 Fleet Street, London, E.C.4. Illustrated. Price 15s.

THERE are only two kinds of experimental test pilots, asserts Bill Waterton—the quick and the dead: "Like dogs, 'planes usually bark before they bite. . . . This is transmitted in many ways, and a test pilot must learn to recognize even subtle variations in feel, sound, vibration and smell. Not only recognize them, but know how to act."

Yet, after reading his book, one wonders if survival could often depend on mere quickness in a jet age. Peter Lawrence was probably quick to recognize what was wrong with the second prototype Javelin when it got into trouble on June 11, 1953: but he died. Survival might depend more often on whether a man is prepared to abandon a valuable aircraft or, like Waterton himself a year earlier, try to get it down in one piece at great personal risk.

It is a pity that he was not content to write a purely autobiographical book, because there is no more lively description than this of the duties that fall to the lot of a chief test pilot. His newer profession of journalism has helped him to tell the story of the 1946 world speed record attempt and his subsequent test and demonstration flying of Meteors, CF-100s and Javelins in a way that is readable for the general public and satisfying to the technician (if occasionally irritating in its terminology). It has also taught him the commercial value of sensationalism.

Waterton's criticism of matters like the aircraft industry's slowness to develop prototypes and of the demonstration "dodges" practised at the S.B.A.C. Display is sometimes justified; but he does not acknowledge that the wartime German and post-war U.S. aircraft industries have suffered setbacks every bit as severe as those experienced by our own, and for much the same reasons; or that equally artful aviation takes place at foreign displays. Nor does he show much appreciation of design or strategy when he implies that our manufacturers are able to build bombers only half the size of the Boeing B-52; he apparently forgets that the great size of the American aircraft reflects its need to carry fuel and equipment for operation over much longer ranges, because its American bases are farther from potential targets than are those of our V-bombers.

It is untrue that the R.A.F. had no aircraft comparable in speed with the 1946 Meteor record-breaker in large-scale service in 1955, and mere foolishness to criticize A.R.B. pilots for lack of jet experience in 1948—before any civilian jet aircraft had flown.

To offset such irritations and frequent misspellings, it is interesting to read that B.E.A. nearly bought two Meteors for a London-Paris mail service in 1948; and to find that Egyptian modifications produced a Spitfire with buried radiators, and Dakota bombing and ground strafing aircraft.

The main undercarriage leg of the Partenavia Tornado (far left) shows simple construction from tube and flat plate. Access to the battery, electrical equipment and instrument panel of the Czech Super Aero 45 (left) is through the hinged nose-cone. The wire grill on the side of the engine assists accessory cooling in hot weather.

LIGHT AIRCRAFT ON THE LIDO

(Continued from page 181)

The F.8 Falco was designed by Stelio Frati, and another of his machines, the Pasotti F.6 Airone* four-seater twin (described in *Flight* of July 13), was to be at Venice in its production form, fitted with Walter Minor 105 h.p. engines. But trouble in importing the engines has delayed its completion and production has not yet got under way. Another non-starter was the Sparviero single-engined four-seater which was to have come to Venice on its second flight. Again there had been some unavoidable delays and the pleasure of seeing it must be reserved for next year.

My final flight that first afternoon was in the very smooth Cessna 182, which I flew with Herr Katz, of Flugzeughandels, A.G., Zürich, the Swiss Cessna agent. What more can one say about an executive aircraft than that it conforms to the full American standards of ease of flying, comfort, quietness and general convenience? The 182 is the nosewheel version of the latest Cessna high-wing four-seater powered by a Continental 0-470-L engine of 230 h.p. The spring-steel main gear of the tailwheel version has been retained and a nosewheel added. The ride on the ground is very smooth indeed and the nosewheel is quite effectively steerable from the rudder bar. Independent toe brakes allow really small-radius turns and short landings. Particularly noticeable right from the start are the remarkable quietness and smoothness of the engine installation, speech at normal level being quite audible at cruising speed. The standard of comfort and the interior colouring are as good as the exterior paint scheme is in most cases deplorable. Cessna have chosen a complicated exterior trim which, in certain colour combinations (and particularly on the 310) tends to become almost repulsive.

Modern American light aircraft always have such assets as convenient doors and proper footsteps. In the case of the Cessna 182 the doors are exactly like those of a car and seem to be quite secure. There is a large footstep on each main undercarriage leg and the front seats can be slid right back against the rear bench so that the pilots can simply swivel on their seats and reach down for the footstep. This can be a dangerous feature if the seat does not lock securely in the forward positions afterwards. Mine did in fact slip back twice during taxying so that I could not reach the rudder pedals properly, but this was caused by a sticky locking-catch which, in un-American fashion, did not go fully home first time. The control column is a push-pull wheel of pleasantly large size. Equipment includes full instrumentation for blind flight and engine supervision, V.H.F., R/T., M.F. receiver with A.D.F. and the V.H.F. navigation frequency band with V.O.R. dial.

I did not find the 182 lively on the controls, but it was very easy and smooth, the interlinked ailerons and elevator making single-control cruising easy. Trim changes were all normal in relation to speed changes and flap extension; and low-speed control was particularly good. Cruising speed is quoted as "over 150 m.p.h." Range, according to the manufacturers, is over 600 statute miles and endurance 4.5 hours.

Not having flown a single-engined Cessna before I now realized for the first time why the makers extol the virtues of their "para-lift" flaps. Full extension of these gives the highly satisfying rate of descent, throttled back, of 1,500 ft/min at 60 m.p.h., which is 20 m.p.h. above the stall. In this condition one can make a very steep approach and haul the wheel back hard to touch down firmly but quietly with the stall-warning hooter bleating plaintively. The procedure seems quite safe and certainly produces a very short landing run indeed. The ample power from the large engine makes going round again and taking off a satisfyingly snappy procedure. The 182 has a wheel-controlled v.i. tailplane for trimming and, though it gives good results, the wheel has been made very low geared to avoid violent over-trimming by a thoughtless pilot. The wheel itself is a little small and rough, and a little too far down on the floor for comfort. Flaps are controlled by a long lever on the floor between the pilots; there are two settings between "up" and "down." Controls are so laid out that the aircraft can be flown solo from either side. In American tradition the roof is not transparent and visibility upwards and rearwards is not generous. Forwards and sideways it is excellent.

Next day I flew with Heini Dittmar in his little H.D.156 Möve. This is the latest version of his three-seater, high-wing monoplane with a Continental 90 h.p. engine. It started as a glider and still has the very thick wing with Dittmar's own high-lift aerofoil section. As Françoise Bottin, the French woman pilot, remarked, "*cet avion est plein d'astuces*"; there are lots of cunning ideas in the Möve. For instance, elevator trim is by spring bias on the control cables, but the bias unit is a big coil spring in full view on the cockpit floor with a small winding wheel attached to a worm screw for altering its tension. This is effective, extremely simple, accessible and light. The top of the nosewheel leg is connected directly to a tube which reaches back to the instrument panel and forms a tiller. Push the tube down and it comes clear of the crutch which acts as the locking device, and the pilot can steer as in a wheel chair. All three wheels have small drum brakes. The cable for the nosewheel brake is controlled by a normal motor-cycle trigger grip on the port control column. Both mainwheel brakes are controlled by a single vertical lever to starboard. The nosewheel brake is most often used. There are no flaps, and spoilers in the wing upper surface act powerfully to reduce lift and steepen approaches.

The Möve's wing is extremely thick over the centre section, with a sharp taper in chord and thickness towards the tips, and some washout. The fuselage is generally of Roman arch cross-section, with an ample cabin for three staggered seats almost abreast and a luggage shelf. Two fuel tanks in the fuselage carry 34 gallons, but extra fuel for endurance up to 14 hours can be carried with pilot only. Maximum weight is 1,650 lb and useful load 650 lb. Cruising speed is 80 m.p.h. and handling is pleasant and free from surprises; despite a slow rate of roll the manœuvrability is good. Control forces are fairly heavy for an aircraft of this size.

Dittmar is undoubtedly a very fine test and demonstration pilot, as well as being a most modest and charming man, and during the air show of the last day he gave one of the finest demonstrations seen. The aircraft he showed had been built by a German toy-shop owner in his shop at Augsburg. It had cost 12,000 marks to build (about £1,000) of which 2,000 were for labour, 4,000 for material and 6,000 marks for the engine. The machine is designed for home construction in much the same way as the French Jodel D.112. Major sub-assemblies were lowered to street level through a window by the local fire brigade. Heini flew the toy-shop owner and his wife over the Brenner Pass to Venice—a journey which requires flying at 7,500ft to 9,000ft.

The last day of the Venice meeting saw the demonstration in public of all the aircraft on show, with the addition of a magnificent exhibition of aerobatics by Capt. Damiani of the Italian Air Force in a Fiat G.46 trainer and a zestful and noisy formation show by four Republic F-84Gs of the Italian 5th Air Brigade. The Jugoslav pilot twice flew the shapely Meteor glider and each time had the spectators on their feet with a beautifully judged landing among parked aircraft and runway markers. M. Goemans flew past in his Apache, waving to the crowd from the back seat as his autopilot did his work for him in the front.

Altogether the Venice meeting was a most enjoyable and technically interesting affair which this year suffered only from the absence of French and British exhibitors.

* *With Italian aircraft the designating letter usually indicates the designer, and a variety of companies build and sell the machines.*

SPAIN-ENGLAND-GERMANY

NEW aircraft from Spain include two to be powered by British gas turbines. One is a twin-Napier-Eland development of the C.A.S.A. 207 Azor transport, a Convair-like machine at present flying with two Bristol Hercules. The Eland version is the subject of a licence-agreement under the terms of which it may be built by Blohm and Voss in Hamburg. The other new design is the C.H.-101, a small supersonic fighter with a delta wing and a Bristol Orpheus turbojet. Construcciones Aeronauticas of Madrid have a production agreement for the C.H.-101 with Heinkel.

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That new £19m look: More news of Capital's Comet order appears below.

CIVIL AVIATION

POSTSCRIPT TO THE COMET ORDER

WE dealt at some length in last week's issue with the new de Havilland Comet 4A, and gave the background to Capital's historic order. Here is a summary of the information which has come to light during the past week.

Capital have said that their first Comet service, which will be from New York to Chicago, is scheduled for January 1, 1959. By then the first of four "interim" Comet 4s will have been delivered (as from November, '58); the ten 4As are due between June and December 1959, and the Comet 4s might then be repurchased. According to Capital, interior fittings, instruments and "other gear" would—as with their Viscounts—be American. The Comets will be used on first-class services.

Mr. Carmichael, Capital's president, said: "We feel that despite the Comet 1 problems, [the Comet 4] is the best tested and safest aircraft in the world. . . . Troubles have been completely offset by the understanding and research which have gone into the production of the Comet 4. . . . We chose the Comet because we felt that an all-jet programme was inevitable. I am perfectly delighted with its performance. The analysis we made of the Comet from an economic and operational viewpoint was far more detailed than even with the Viscount." The turboprop Electra, he added, would have enabled competitors to overtake Capital's lead, which he expected to maintain for "several years" with the Comet.

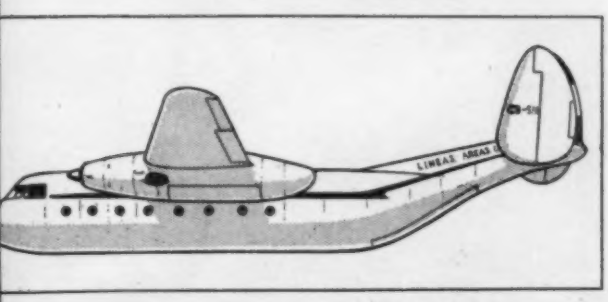
Significantly, Mr. Carmichael stated that American manufacturers had not been able to "guarantee production" of any aircraft that would be specifically built for the medium-ranges (average 575 miles) operated by Capital. "During the past year," he said, "we have gone to all U.S. manufacturers, but none of them would build a 'plane to meet our requirements."

One of the biggest tasks facing de Havilland now is the programme for certification of the Comet 4 and 4A by the C.A.A. A certificate has already been formally applied for, and a "preliminary certification team" is being sent by the C.A.A. to Hatfield on August 20. Capital say they have discussed certification with the C.A.A., and anticipate no difficulties.

Mr. A. F. Burke, managing director of the de Havilland Aircraft Company, says he considers 50 Comet 4s and 4As—another 17—would have to be sold to break even. Another 800 workpeople would be required as a result of the Capital contract; 75 per cent of the drawings had already been issued to the shops, and the first customer—B.O.A.C.—will receive four aircraft before first Capital deliveries (this suggests earlier Comet 4 delivery to B.O.A.C. than the "late 1958" previously quoted). Mr. Burke said that the aim was always to beat contract dates by "at least six months" if possible.

Mr. J. D. Pearson, director of Rolls-Royce Aero Division, has said that the Capital contract will mean £25m-worth of business for his company over the next ten years. Two Comet 2s are to be fitted with RA.29s for development flying, and Mr. Pearson has confirmed that both Comet 4 and Comet 4A will, if required, be able to have reverse thrust as well as Greatrex silencing. This does not necessarily imply that a requirement for reverse thrust has been "written into" B.O.A.C.'s and Capital's contracts. Capital's Avon engines, says Mr. R. M. Kendall, general manager of Rolls-Royce Canada, will—like the Dart—be overhauled in Montreal.

Overshadowed by the Comet contract was Capital's repeat-order for 15 Viscount 745Ds, increasing the fleet to 75.



THE BRITANNIA ADVANCES

THE imminent maiden flight of the first Britannia 300 (see p. 179) is a favourable occasion to summarize general Britannia development. Some 5,009 hr flying have now been completed, 2,000 of them by B.O.A.C. on proving flights and from their training base at Hurn and with Bristol. The Series 100 aircraft G-ANBH is again undergoing icing tests at Entebbe after a replacement engine—flown out from Britain—had been fitted last week. It is reported that the extreme icing conditions required have been found over East Africa, making tests in India unnecessary. First reports indicate that although a complete cure of the present difficulties has not yet been found—"bumps" (flame-outs in individual combustion chambers) still occur—the in-passenger-service date of early October is not necessarily imperilled. Meanwhile, further orders for the Britannia may well depend upon the results of actual Series 100 operation.

The development pace of the Bristol B.E.25 Orion two-spool turboprop engine is encouraging. Bench-running started just before last Christmas, and, by May, 500 hr had been completed. Flight development is to begin very shortly. The well-known prototype Britannia G-ALBO (now painted in the red and white colour scheme of a Bristol Engine company development aircraft) is expected to appear at Farnborough with a very rich mixture of engines, including an Orion. Mounted inboard will be the standard Britannia 100 Proteus 705s; outboard will be a Proteus 755 (Britannia 300 Series), and an Orion.

This new engine, which has deliberate power-limitation to provide constant power in varied airport altitude and temperature conditions, is expected to be ready for quantity service by 1959. By then nearly all of B.O.A.C.'s Series 302, 305 and 312 aircraft (powered with the Proteus 755) will have been delivered. Sixty Orions have been ordered by B.O.A.C. for the retrospective re-engining of the long-range Britannia fleet.

A total of 55 Britannias is now on order, distributed as follows: *Britannia 100:* the initial production aircraft, 15 of which are on order for B.O.A.C. (five delivered), designated 102. *Britannia 300:* a lengthened version of the Series 100 of which two—302s—have been ordered by B.O.A.C. (an additional five for B.O.A.C. are to be provided with 310 wing-tankage to give improved range, and are designated 305). *Britannia 310:* the long-range version of the Series 300. Eleven 312s are on order for B.O.A.C., three (313s) for El Al, and five (314s) for C.P.A. *Britannia 250:* similar to the 310, three of these aircraft have been ordered by the M.o.S. as special mixed cargo/passenger transports, and a further 10 by R.A.F. Transport Command.

RAPID INDEPENDENT EXPANSION

THE results of 80 meetings held last year by the Air Transport Advisory Council—the "official channel" through which all applications for new U.K. air services pass to the Minister—are to be found in the annual report, published last week. This records that 378 new applications were received (347 from independent companies), a total of 412 including 34 applications outstanding from the previous year. The Council made recommendations to the Minister on 315 (284 from independents): of these 282 were recommended for approval and 33 for rejection. The Minister approved 275 in whole or in part and rejected 33; decisions on the outstanding cases are, in the main, dependent on discussions with foreign governments. The most illuminating part of the document (available from H.M. Stationery Office, price 2s) is Appendix E, which contains analyses of the A.T.A.C.'s recommendations and of the Minister's decisions.

The A.T.A.C.'s report shows that the independents' scheduled operations, although only a small part of their activities, have continued to expand rapidly, having been doubled in two years. Total traffic has been trebled.

Turbo-Pioneer: There has recently been speculation about a 40-passenger, 10,000 lb-payload development of the Scottish Aviation Twin Pioneer powered by Darts. Here is a first impression of this project.

Seen about to take off from Bristol for B.E.A.'s headquarters at Ruislip in a Sycamore are Mr. C. T. D. Hosegood, Bristol chief helicopter test pilot (at the controls); Capt. G. W. James, B.E.A. flight operations director; and, in the rear seats, Mr. H. E. Marking, B.E.A. secretary, and Mr. R. Whitby, performance and analysis manager. They had been attending to Bristol 173 business (see p. 170, "Flight," last week).

CIVIL AVIATION . . .

THE SEPARATION PROBLEM

THE ability of air traffic control to regulate expanding traffic-flows must largely depend upon the accuracy with which the regulation can be made; for whatever steps can be taken to improve the radius of control, it is certain that traffic densities will increase. Solutions to the problems of vertical separation are consequently of first importance, for present height maintenance inaccuracies make nominal 1,000ft-separations inadequate for safety on consideration of altitude alone, and too much reliance must be placed on "fortuitous horizontal scatter"—two aircraft at the same height but not at the same place at the same time. Even this element of chance is decreasing with improved directional aids such as V.O.R.

The inaccuracies of aircraft altimeters—the fly in the separation ointment—have been studied by a special I.C.A.O. panel, and recommendations are to be put into effect as soon as possible. The panel's analysis listed 15 contributory factors to account for pilots flying at incorrect altitude, six of which were considered to be of major importance. Errors in the instrument calibrations due to the diaphragms, hysteresis, friction and instability, may account for discrepancies of 170ft at 10,000ft and 300ft at 20,000ft, and could be reduced by rejection of altimeters which cannot meet certain mechanical tolerances now proposed internationally by the I.C.A.O. panel. In addition, new electrical servo instruments which are being developed should be accurate to a quarter of one per cent of scale-reading, or half of one per cent if the electrical system fails.

Position error of the static pressure source is responsible for even greater difficulties. The growing speed of modern aircraft may result in pressure variations between aircraft of the same type changing from one year to the next. The solution proposed in this case is the preparation of static pressure-system correction cards for application by crew members, and although this will be inconvenient, at least the static pressure-system errors have been established for most present-day aircraft.

Even assuming completely accurate altimeters, vertical separation is influenced by the pilots being unable to maintain a completely consistent level, although this error can be reduced by the use of auto-pilots with locking height control. "Flight technical error"—the term given to these pilot inconsistencies—has been shown to increase with altitude within the range of 175ft at 10,000ft altitude to 440ft at 20,000ft, and consideration must be given to the case where an additional 500ft, say, has to be climbed to achieve the correct nose-down angle of attack for an assigned level. Some allowance for abnormal weather conditions must also be made.

Combined errors under all these conditions indicate that the likely separation on three in 1,000 occasions (where normal separation is 1,000ft) will vary from +87ft at 10,000ft when flying at the standard altimeter setting of 1,013.2 mb to −786ft at 20,000ft near QNH boundaries when flying on regional altimeter settings.

The panel consequently recommended that a standard pre-take-off check be made, static pressure correction curves be applied, procedures where QNH is used be improved, and positive control be exercised over aircraft at QNH boundaries when extreme pressure gradients exist. Accurate QNH values and auto-pilot height lock should also reduce the flown altitude scatter.

Civil aviation authorities, operators and pilots all have responsibilities in vertical separation safety. The longer term solution appears to rest with the manufacturers—and here prospects are encouraging.

BREVITIES

A FURTHER proving flight (see *Flight*, July 20) has been made by the Tu-104, from Moscow to Irkutsk in South Russia. The 2,790-mile flight was made in slightly less than six hours. Next year it is planned to fly from Moscow to Vladivostok, a greater distance than Moscow-New York.

* * *

Air-India is planning to run a weekly service between London and Sydney by way of Madras before the end of this year.

* * *

Captain Peter Fair has been appointed general manager of Bahamas Airways.

* * *

The American University, Washington, will conduct the Tenth Air Transportation Institute from October 16 to November 2.

* * *

Union of Burma Airways representatives have been in Dublin studying Aer Lingus Viscount operations.

* * *

B.W.I.A. announce fare reductions between Barbados and San Juan and other points in the N.E. Caribbean, following the agreements at the Cannes I.A.T.A. Conference.

* * *

There was a 34 per cent increase in business transactions through the I.A.T.A. clearing house during the first quarter of 1956.

* * *

The House of Representatives has passed a bill banning the supply of alcohol to passengers on flights made in the U.S. The ban does not apply to international flights.

* * *

Five more Convair Metropolitans are to be added to the S.A.S. order for 11 at a total cost, including spares, of approximately £1,730,000. Delivery will begin in January 1957.

A Transair "Dakmaster" was used recently for an exchange of students between Moscow and London in association with Aeroflot. The change-over point for 25 English and 25 Russian students was Prague.

* * *

Air Charter expect to operate 500 flights—carrying over a thousand cars and motor cycles and 3,500 passengers—between Southend and Calais and Ostend during the five day period at the end of July.

* * *

Aer Lingus made a net surplus of £41,495 during the financial year 1955-56 after development expenses, balance of capital loss and a sum for taxation provision had been written off the operating surplus. The overall revenue load factor was 67 per cent.

Now called the Super "Star" Constellation, here is the first L.1649A taking shape at Lockheed, Burbank. Five airlines have now ordered 46.

CORRESPONDENCE

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns; the names and addresses of the writers, not for publication in detail, must in all cases accompany letters.

"Not So Incidental"

WITH reference to the news item with the above heading on page 106, *Flight*, July 20, we heartily endorse the comments made. We of this company feel that the probe-and-drogue system, and in fact, the earlier "looped hose" system of refuelling in flight, for which this company is responsible, are also major aids adopted by the United States of America. The U.S. Navy adopted probe and drogue some six years ago.

The "boom" system was developed by the Boeing Company as an answer to the "looped hose" system before the development of probe and drogue, but could not be conveniently housed on a carrier-borne tanker.

Lucky Lady, the first aircraft to fly round the world non-stop, could only have done it by employing the British-developed "looped hose" system.

Tarrant Rushton, Dorset. P. G. PROCTER,
Technical Sales Manager, Flight Refuelling, Ltd.

[The news item referred to a protest made to *Life* magazine by Mr. John Peck, of the British Information Services in New York, about the use of the phrase "incidental air community" in referring to Britain. Mr. Peck enumerated three aircraft carrier aids which had been adopted by the U.S. Navy.—Ed.]

The Size of an Airline

FROM his comments on Sir George Pirie's speech at the annual general meeting of the Air League, in which Sir George argued that there was a relationship between an airline's route mileage and its efficiency, it would seem that Mr. Black (*Flight*, July 20) did not fully understand the point of view of the Air League Council regarding this relationship.

It can be shown that in 1953, the last year for which full figures are available, there were some 31 airlines in the world, excluding South America, with more than 1,000 employees. Of these, eight have a route mileage in excess of 25,000, and of these only two had a productivity per employee (a reasonable test of efficiency) in excess of 20,000 capacity ton/miles per annum. Of the 23 airlines with less than 25,000 route-miles, 14 had productivity figures well in excess of this. If the standard is set at 30,000 capacity ton/miles per employee per annum, then no carrier with over 25,000 route-miles was efficient, while 11 of those with less route mileage achieved better results.

Admittedly, none of the three criteria of efficiency is satisfactory—not even Mr. Black's test of capacity ton/miles compared with load ton/miles (generally more simply called "load factor") because this can be artificially boosted by a very inefficient airline, i.e., by uneconomic advertising, or cutting of fares. But if Mr. Black, using the published results of airlines, should apply route miles against efficiency as measured by almost any standard (productivity per employee, cost per c.t.m., airline profit or loss, rate of capital turnover, etc.) he will find that although a route mileage of less than 25,000 is not a guarantee of efficiency, it appears to be impossible for an airline with greater route mileage to be really efficient.

This is the basis of the Council's argument that, so far from amalgamating B.O.A.C. and B.E.A., the right course would be to split up B.O.A.C. into manageable units. Whether they should be nationalized or private enterprise is another problem, requiring separate consideration. F. N. HILLIER,
W.1. Secretary-General, Air League of the British Empire.

Con-di Pro and Con

NOT being of very long standing in the engineering industry, I hesitate to comment on R. M. Bass's remarks (*Flight*, June 15). But it would appear to me that the term "con-di," as applied to nozzles, is not (as your correspondent suggests) a neologism, but merely a convenient abbreviation of the self-explanatory term "convergent-divergent nozzle."

Newbridge, Mon. R. H. LEWIS.

THE INDUSTRY IN BRIEF

Hawker Aircraft (Blackpool), Ltd., announce that Mr. E. H. Jefferson has relinquished his appointment as general manager with effect from July 31. Responsibilities of the general manager are now being undertaken by Mr. J. T. Lidbury. Mr. Jefferson, who is returning to the south of England, will remain a director of the company.

* * *

International Aeradio, Ltd., announce that "several years' negotiations" with the Swiss Air Force have now resulted in an order for a radar trainer. The trainer—a Marconi Type ST 201—is to be modified by I.A.L. so that it can be used with the radar equipment used by Switzerland. Instructors' panels and controls are to be incorporated in an I.A.L. air traffic control desk.

* * *

A Sikorsky S.51 which had been wrapped in "Visqueen" film for an eight-month sea voyage, during which it travelled 16,000 miles, arrived in England recently. The film had protected it from corrosion, and the helicopter, one of two shipped to the Antarctic for use in the Government-sponsored 1955-56 Graham-land Survey, was said by its owners, Autair, Ltd., to be in "excellent condition." Spares were also wrapped in the film, which is supplied by British Visqueen, Ltd., a subsidiary of I.C.I.

* * *

From Edward A. Pearce and Partners, of 28 Baker Street, London, W.1, comes an announcement that they have taken over the practice of the late H. G. A. Reeves, M.A., A.M.I.Mech.E., who lost his life last autumn whilst supervising a test of turbojet ground-silencing equipment he had developed. Pearce and Partners state that they are continuing his work except for heating and ventilating, in which field Mr. Greatorex, 15 Berners Street, London, W.1, will deal with Mr. Reeves' former clients.

* * *

The French firm Bronzavia S.A., of Courbevoie, near Paris, makers of aircraft accessories, recently signed an agreement to manufacture and market the Napier "Spraymat" de-icing system. To mark the occasion, Bronzavia organized a party in Paris at which members of the French aircraft industry met Mr. C. L. Cowdrey, manager of Napier's flight development establishment at Luton and one of the men responsible for the development of "Spraymat." This de-icing surface is sprayed on with a flame gun in three layers. The inner and outer layers are insulating material, the centre the sprayed-on metal element. Earlier this year Napier's received a production order for the installation of "Spraymat" in the Fairey Gannet.

* * *

The Stewart Aeronautical Supply Co., Ltd., will be occupying new premises, from August 14 onwards, at Adastral House, Low-field Heath, Crawley, Sussex (Crawley 4300).

* * *

A party of 25 Commonwealth representatives, attending the fourth meeting in London of Commonwealth Military Communications Electronics Representatives, visited the New Southgate Works of Standard Telephones and Cables, Ltd., recently for discussions on and demonstrations of the latest types of ground and airborne radio communication and navigational equipment.

* * *

From Redifon, Ltd., comes information that their radio transmitters are being employed in the new communications technique, "Janet," which has been developed by Canada's Defence Research Board. This system, which uses the trails of minute meteors to "bounce" radio signals round the curvature of the earth, was described recently by Mr. Ralph Campney, Canadian Minister of Defence (see *Flight* for July 20, page 107).

FORTHCOMING EVENTS

Aug. 1-12. Central Aero Club of U.S.S.R.: World Parachuting Championships, Moscow.
Aug. 4. R.N.A.S. Brawdy: At Home.
Aug. 5-6. World Power Model Championships, Cranfield.
Aug. 11. R.N.A.S. Lee-on-Solent: At Home.
Aug. 17-19. Sportsflyveklubben: International Rally, Denmark.
Aug. 25-26. Midland Aero Club: International Rally, Elmdon, Birmingham.
Sept. 3-9. S.B.A.C. Display, Farnborough ("Public" days, 7th, 8th, 9th).
Sept. 7-12. French Grand Prix, France.
Sept. 10-16. Battle of Britain Week.
Sept. 15. Battle of Britain Day.
Sept. 18-23. Aero Club of Italy: International Air Week.
Sept. 27-28. Aerodrome Owners Association: Annual Conference, Southampton.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

Sir Anthony Eden, as Honorary Air Commodore, presents the Esher trophy to S/L. Chandler of No. 500 (County of Kent) Sqn., R.Aux.A.F. (see news item below).

Royal Visit

LAST Friday Princess Margaret visited R.A.F. Horsham St. Faith, near Norwich. She toured the station after taking the salute and inspecting a guard of honour, then watched a flypast and the Hunters of No. 43 Sqn. giving a display of formation aerobatics. In a hangar she was shown a static display of R.A.F. fighters, including a Javelin, and watched an ejector seat demonstration.

Princess Margaret had flown from London in a Viking of the Queen's Flight, being met by Sir Edmund Bacon, Lord Lieutenant of Norfolk, Air Marshal H. L. Patch, A.O.C-in-C. Fighter Command, A.V-M. H. P. Fraser, A.O.C. No. 12 Group, A. Cdre. J. Worrall, Eastern Sector Commander, and G/C. J. H. Iremonger, station commander.

Esher Trophy

LAST Saturday Sir Anthony Eden, the Honorary Air Commodore of No. 500 (County of Kent) Sqn., R.Aux.A.F., presented the Esher Trophy for 1955 to the squadron at West Malling, Kent. It was received by S/L. D. H. M. Chandler, the C.O.

The Esher Trophy is awarded annually to the Auxiliary squadron showing the highest operational standard in its record of pilot efficiency, maintenance, recruiting, attendance at annual camp and discipline.

Handling Squadron Abroad

NEXT Wednesday a detachment from the R.A.F. Handling Squadron, Boscombe Down, the agency responsible for writing all new *Pilots' Notes*, is to begin a tour of Near and Middle East bases to discuss the handling of squadron aircraft and to ensure that the notes on the various types are meeting requirements. Under the leadership of W/C. J. A. Brignell, the C.O., they will visit Malta, Cyprus, Jordan, Iraq, Aden and Kenya, returning to England on August 24.

The Handling Squadron was formed in 1939 as a flight in C.F.S. with the task of evaluating the characteristics of new aircraft for the R.A.F.

No. 41 Sqn. Birthday

FROM Biggin Hill, No. 41 Sqn. Hunters flew in formation over the French town of St. Omer on July 14 to celebrate the squadron's 40th birthday. It was formed near St. Omer on July 14, 1916, and was allowed to incorporate the double cross of the town's arms in its badge in recognition of its work in World War 1. The scroll authorizing this incorporation now hangs in the Officers' Mess at Biggin Hill. The present C.O. is S/L. J. Castagnola.

No. 41 Squadron flew from England during World War 2, claiming 200 enemy aircraft destroyed and taking part in operations over Dunkirk and Dieppe, intercepting German fighter bombers and flying bombs and covering the Normandy invasion.

Senior Appointments

IT is announced that G/C. S. J. Marchbank has been appointed Air Deputy at the NATO Defence College in Paris, with the acting rank of air commodore. G/C. O. D. Allerton has been appointed to command No. 16 M.U., Stafford, with the acting rank of air commodore.

G/C. Marchbank was commissioned in 1932 and commanded No. 102 Sqn. during the war, taking part in the raid on Peenemünde in 1943. He took an R.A.F. Staff College course in 1945 and the Joint Services Staff College course in 1950. He then served in Germany and at H.Q., A.F.N.E. before commanding R.A.F. Thorney Island.

G/C. Allerton served in Air Ministry and Transport Command from 1934 until 1943, after being stationed in India. After World War 2 he served in Maintenance Command and at Air Ministry before taking command of No. 7 M.U. in 1953.

A. Cdre. Godman

WE regret to record the death, at his home at Northallerton, Yorks, of A. Cdre. A. L. Godman, C.M.G., D.S.O. He was 78. A. Cdre. Godman retired from the R.A.F. in 1931. In 1932 he became secretary of the York (North Riding) Territorial Army and Air Force Association, and from 1938 to 1943 he was commandant of the Northern Area of the R.O.C.

Coastal Command Magazine

A QUARTERLY magazine called *Cocktail* is now being produced by F/O. N. H. Thompson, Education Officer of H.Q. Unit, Coastal Command. Air Ministry approval and support has been granted and the magazine is the first of its type ever to be produced for an R.A.F. Command in this country. The summer issue is out.

F/O. Thompson was previously editor of the Birmingham University magazine *Mermaid*, and music critic of the Guild of Undergraduates' newspaper. Last year he was responsible for the musical direction of the Oxford Experimental Theatre Club's production of *Jam Today*.

F.C.U. Efficiency

THE No. 13 Group Efficiency Trophy for R.Aux.A.F. Fighter Control Units has been won for 1955 by No. 3505 (East Riding) F.C.U. This is the first time the trophy has been awarded since its institution.

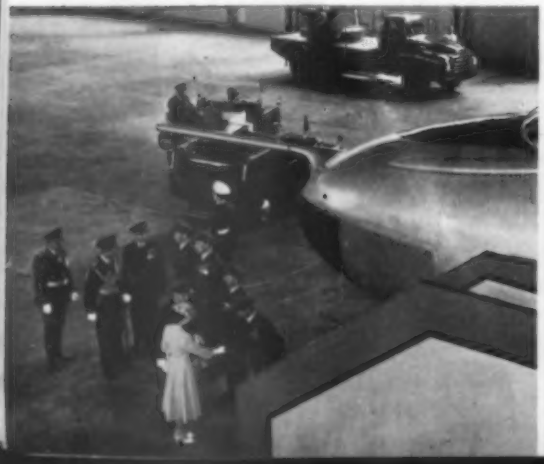
New Matron-in-Chief

APPROVAL is announced of the appointment of Group Officer A. M. Williamson as Matron-in-Chief of Princess Mary's R.A.F. Nursing Service, with the rank of air commandant, from September 1. She succeeds Dame Roberta Whyte, who is retiring.

Mauripur to Close

IT has been agreed between the British and Pakistan Governments that the R.A.F. staging post at Mauripur should be closed at the end of the year to enable the P.A.F. to have full use of the base. Karachi civil airport will thereafter be used by the R.A.F. for staging.

During the Queen's recent visit to Marham she was shown a Valiant with the complete flight refuelling probe (left) by W/C. L. H. Trent, C.O. of No. 214 Sqn., and was greeted on arrival (right) by Sir Edmund Bacon, Lord Lieutenant of Norfolk, and (l. to r.) Air Chief Marshal Sir Dermot Boyle, C.A.S.; Air Marshal Sir Harry Broadhurst, A.O.C-in-C. Bomber Command; A.V-M. Sir John Whitley, A.O.C. No. 1 Group; A.V-M. K. B. B. Cross, A.O.C. No. 3 Group; and G/C. L. M. Hodges, Station Commander.



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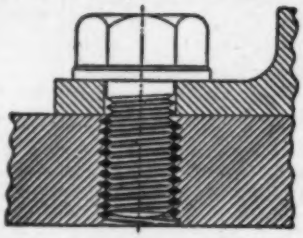

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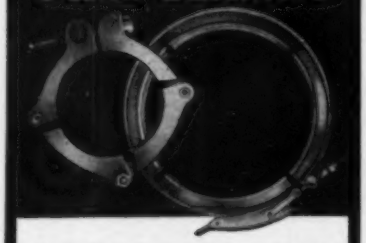

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Applicants should have recent experience in the design of assembly and sub-assembly fixtures for modern aircraft. H.N.C. preferable, but not essential, provided applicants have the right experience.

This is a good opportunity for competent men, and there is a contributory Pension Scheme, and free Life Assurance benefits.

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Project Designer for Rocket and Ramjet engines with Aircraft and missiles applications. Should be first class mechanical designer, preferably with previous experience with combustion design problems and with knowledge of metering systems and fuel controls. At least H.N.C. standard.

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PILOT, Cessna 172, returning Kenya August, requires co-pilot. Must have current pilot's and/or navigator's licence. Share expenses—Carr, care of Furze Lodge, Langley, Bucks. [5563

PUBLIC ANNOUNCEMENTS

AIR TRANSPORT ADVISORY COUNCIL

THE Air Transport Advisory Council give notice that they have received the undermentioned application to operate a scheduled air service:—

APPLICATION No. 35/2. From B.K.S. Air Transport Ltd., of 1, Marylebone High Street, London, W.1, for amendments to the terms of the approval of the U.K. Internal Service on the route Newcastle and/or West Hartlepool-Leeds (Yeadon) (optional)-Bournemouth (Hurn) (optional technical)-Guernsey (optional)-Jersey which they are approved to operate via the traffic stop at Leeds (Yeadon) at a frequency of up to one return flight daily for the period up to 31st March, 1957, so as to continue the operation of the service via a traffic stop at Leeds until 30th April, 1960 at an increased frequency up to 21 return flights weekly. The Company also ask for permission to operate the service at their discretion on the Leeds-Channel Islands sector only.

THIS application will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on 30th July, 1952. Any representations or objections with regard to this application must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3, Dean's Yard, London, S.W.1, from whom further details of the application may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. [5567

PUBLIC APPOINTMENTS

THE COLLEGE OF AERONAUTICS

At the request of H.M. Government, the College is providing yearly courses on the theory and practice of guided missiles to graduate students sponsored by N.A.T.O. countries.

Applications are invited for appointments to the teaching and engineering staff from candidates with suitable qualifications and experience in any of the following subjects:

Aerodynamics
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Simulation
Trials
Production

Practical experience in G.W. work is desirable but consideration will also be given to candidates with adequate knowledge of the basic techniques.

Salary depending upon qualifications and experience in the range £750-£1,400, plus family allowance where applicable.

"Approved employment" conditions under Civil Service regulations will apply.

Applications giving full particulars and names and addresses of three referees should be forwarded to the Recorder, The College of Aeronautics, Cranfield, Bletchley, Bucks. Further particulars available on request. [5564

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for their VIKING and YORK fleets

Minimum qualifications are

FIRST CLASS FLIGHT RADIO OPERATOR'S LICENCE

as issued by M.T.C.A.

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London Airport, Hounslow, Middlesex

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INSPECTOR

of advanced status and considerable experience of aircraft inspection work. Experience with light alloy welded components is essential. Candidates must have administrative ability and be able to organise as well as conduct inspection of prototype and development projects. Salary for this staff appointment will be commensurate with qualifications and experience. Contributory pension scheme. Written applications quoting Ref. SF2 and full details to **Personnel Officer (Staff), Magnesium Elektron Limited, Clifton Junction, Swinton, near Manchester.**

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SITUATIONS VACANT

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FIRE OFFICER, experienced Civil Fire Brigade, preferably single, for service at overseas airports. Additional experience in aircraft fire, crash and rescue services and M.T. maintenance desirable. Pension and free insurance scheme, free accommodation and air passages. Basic salary £570 plus minor station allowance of £400 all tax-free.

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VACANCIES exist in the London Airport Design Office for junior, detail, or trainee draughtsmen to work on development modification design on the Corporation's fleet of airliners.

THE work covers a wide range of interesting projects on structures, interior layout, furnishings, radio installation, galley and toilet compartment design.

THIS is an excellent opportunity to learn the operational side of aircraft design.

APPLICATIONS are invited from those wishing to transfer from existing employment as junior draughtsmen, also from those without drawing office experience, but with good practical training and/or intending to follow O.N.C. or H.N.C. studies.

A.E.S.D. rates plus attractive proficiency pay scheme. Generous insurance, sickness and pension schemes. Excellent Staff Restaurant facilities. Wide range of sports and social club activities. Write, giving details of experience to Assistant Staff Manager (Appointments), B.O.A.C., London Airport. [5559

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THERE are vacancies for Senior, Intermediate and Junior Draughtsmen with experience of aircraft design, and applications from Draughtsmen and Draughtswomen without such experience will also be given careful consideration.

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One of the problems in the Modern Aircraft Design Office is that many really first-class Draughtsmen or Designers find that they have to leave the Drawing Board in order to get on.

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Young man having completed National Service and possessing H.N.C. in Chemistry is invited to apply for a post in the Corrosion Research Laboratory of this large engineering concern in West London. Interest in Electrochemistry and surface treatments essential. Every encouragement given for continuation of technical studies. Opportunity for advancement. Give full details of qualifications, experience, age and salary required, to

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SITUATIONS VACANT

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BLACKBURN & GENERAL AIRCRAFT, LTD., Brough, E. Yorks, require an Assistant Chief for their Aircraft Tool Design Office. Applications are invited from suitably qualified men who have recent experience in the design of sub-assembly and assembly jigs and fixtures for modern high speed aircraft. The position presents an excellent opportunity for the man with the right experience. Good salary will be paid, with contributory Pension and Free Life Assurance benefits. Written applications, giving age, experience and qualifications in the first instance to the Personnel Manager at the above address. Mark envelope "Jig and Tool." Those applicants called for interview will have their travelling expenses refunded. [5503

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Bristol Aircraft Limited need two technical engineers for their maintenance design section to work on modern civil aircraft. Their work would be concerned with compiling electrical maintenance and test schedules from design data. Thus it would appeal particularly to men with electrical experience who would like to apply their practical knowledge to theoretical problems. O.N.C. or Gity and Guilds is a minimum requirement.

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Filton House, Bristol. [5558

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A. & C. Licensed Engineer required for maintenance of light aircraft of all types up to Rapide. Top salary paid to right man.

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EXPERIENCED Aircraft Stressman.

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GOOD working conditions in pleasant locality. Cheap flying available.

WRITE, stating age, experience and salary required to Design Office Superintendent, Western Airways, Ltd., Exeter Airport. [5549

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SENIOR Stressman required, B.Sc. degree or H.N.C. and A.F.R.Ae.S. with at least five years' experience on aircraft structures. Also required a Weights Engineer and a Flutter Technician.

Full details of qualifications and experience to Personnel Manager, Folland Aircraft, Ltd., Hamble, Hants. [5555

SAUNDERS-ROE
LIMITED

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Senior, Intermediate and Junior

DRAUGHTSMEN
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and other Technicians at their London, Eastleigh and Osborne, I.o.W design offices.

Applications will be welcomed from experienced technicians who are keen to join an expanding organisation engaged on interesting and advanced projects of an important nature.

Conditions are good and assistance with accommodation can be given to those selected to work at Osborne.

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Regular work with Bonus and Overtime

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MECHANICAL AND ELECTRICAL DESIGNER DRAUGHTSMEN AND DEVELOPMENT ENGINEERS

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Good salaries and working conditions await the successful applicants, and speedy contract transport will take you to and from the aerodrome.

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Check with the **Chief Designer at Flight Refuelling Limited, Tarrant Rushton Airfield, Blandford, Dorset.**

SITUATIONS VACANT

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ASSISTANCE with accommodation will be given to successful applicants.

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Please write for further particulars, in confidence, to:—

The Technical Staff Manager

BLACKBURN & GENERAL AIRCRAFT LTD.

Brough, E. Yorkshire

M A R S H A L L

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SENIOR AIRFRAME INSPECTORS REQUIRED

Must have recent experience on Multi-Jet and Turbo-Prop Aircraft

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Applicants who prove suitably qualified will be given **Staff Rates and Conditions, including Contributory Superannuation, plus Housing assistance if required.**

Send full particulars, age, experience, and when available for interview to—
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